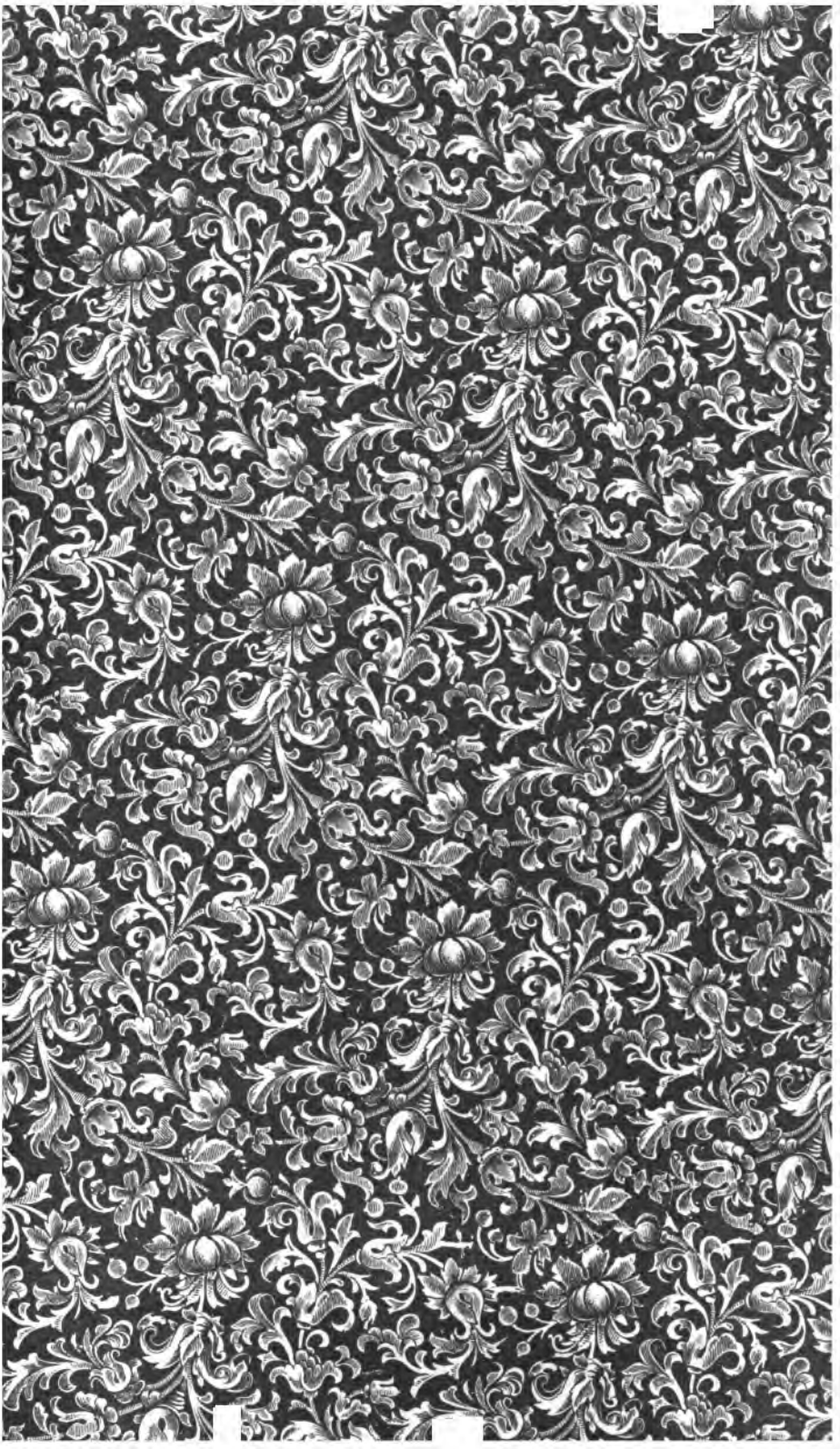

OPERATIVE TREATMENT

OF

IRREDUCIBLE DISLOCATIONS OF THE SHOULDER-JOINT

RECENT OR OLD, SIMPLE OR COMPLICATED.

BY

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THIS

LITTLE BOOK

CONTAINS THE RESULTS OF STUDY AND INVESTIGATION,

WHICH I GAVE AS A LABOR OF LOVE, IN RESPONSE

TO THE REQUEST OF MY ASSOCIATES,

FELLOWS OF THE AMERICAN SURGICAL ASSOCIATION,

AND TO THEM IT GIVES ME GREAT

GRATIFICATION

TO

INSCRIBE IT.

CONTENTS.

[1] Treated through an anterior incision.

[1] And forward.

OPERATIVE TREATMENT OF IRREDUCIBLE DISLOCATIONS OF THE SHOULDER-JOINT, RECENT OR OLD, SIMPLE OR COMPLICATED.

HISTORY.

One morning in 1895, upon visiting my wards in the Charity Hospital, I found an old man with a case of irreducible dislocation of the shoulder of three months' standing. He suffered much pain, and was anxious for relief. I remembered having seen, during the many years of my connection with this hospital, some eight or ten cases of such irreducible dislocations. Two, who had been put through the extension and manipulation processes, had suffered fracture of the bone near the head. None of those who had resisted tractions and manipulations of all sorts had been operated; all had been turned away to remain crippled for the remainder of their days. And yet they were under the care of such men as Stone, Richardson, Smyth, Logan, Chopin, Schuppert, all men of recognized judgment and unsurpassed daring. Later, upon writing to a member of this Association, who once graced the presidential chair, for information on the subject, he answered that very few surgeons operated on these cases, and they were left to be maimed for life.

To show the unsettled condition of mind of some prominent surgeons, I will state that, in a private communication from one of them attached to one of the largest hospitals in this country, he says that the question arose as to whether operative interference should be attempted, and having called in consultation

two other prominent surgeons, it was *finally* decided to operate. My first impulse was to follow the tradition, but the patient complained so much that I determined to operate, if but to relieve the pain due to the pressure of the dislocated head upon the nerves and the vessels. Before doing anything I attempted to post myself on the operation, but text-books were almost mute on the subject; standard works even said nothing, or very little; special cases or monographs were not at hand, and too far away to be had in time. The history of the case is given further. Once engaged in this line of thought, I became intensely interested, all the more so that another case had presented itself at the hospital in the meantime, and was awaiting treatment.

Upon making bibliographical researches, I was quite amazed to see how much the subject had engaged the attention of a number of surgeons, and also how inconceivable it was that, in spite of this, so little was to be found in text-books and others on so important and captivating a subject.

The first cases are reported by Weinhold and Swanzig in 1819, and by Wattmann, 1820. After an interval of nearly twenty years comes a case by Dieffenbach, in 1839, and after another lapse of thirteen years, the case of Simon in 1852. The indefatigable Langenbeck then follows with three cases in succession, and Post with one in 1861. Almost every year after this at least one case is reported. In the sixties, three cases; in the seventies, twenty-two; in the eighties, forty-nine. As we draw near the present date, cases became more numerous; the year 1891 alone saw thirteen cases; 1893, eleven; 1895, seventeen. Special papers, or dissertations more or less important, have been written by some eight or ten surgeons. Of these the particularly important, valuable, epoch-making are those of Knapp, 1891[1], Smital, 1890[2], Delbet, 1893[3a], and McBurney, 1895[3b]; all within these late years.

In this array of cases American surgeons have contributed largely. Ollier says that the first resection for irreducible dislocation was performed by Post, of New York[4], and the second one by Warren, of Baltimore[5].

The second French Congress of Surgery put up the question

of interference in irreducible dislocations; a certain number of communications were made regarding interference in dislocations of the shoulder,[6] but they are based upon insufficient data.

DIVISIONS, FORMS, AND VARIETIES OF IRREDUCIBLE DISLOCATIONS OF THE SHOULDER.

The subject which is now engaging our attention presents, from a clinical and practical standpoint, a number of forms and varieties which must be well defined at the outset. By clinical form and variety we mean a condition characterized by some feature or features bearing upon the diagnosis, the prognosis, treatment, and result.

These various forms and varieties may be summarily stated as being: First, recent, simple or complicated, and operated by reduction or resection. Second, old and simple, forward, downward, etc., and treated by reduction or resection through an anterior incision, or an axillary, or a posterior incision; or treated by subcutaneous section (fibrous, tendinous, muscular, osseous), or by an osteoclasia. Third, forms and varieties due to causes anatomical or physiological, to causes pathological, to complications, to recurrences; last, to the sequels of the operation.

We say this once for all, as we will not mention these headings in each case, thereby relieving the reading of monotonous repetition; but the reader will kindly bear in mind all the time the order followed in describing the peculiarities.

This study rests on one hundred and fifty-four operated cases. It is rare cases that most require collective and minute investigation, since one operator has seldom the opportunity to acquire extensive personal experience, and has to fall back upon that of others. Hence we report herein the histories of the cases with all details of some interest, which details are so eagerly sought and so gratefully appreciated by operators who have a rare and difficult case to deal with.

We always append the year to the name so as to identify the

case throughout, specially when the name of the same operator has been repeated in two or more cases.

Incomplete data is a very serious obstacle to a thorough study.

IMPORTANT RULE.

It goes without saying that no operation should be attempted before all possible means of bloodless reduction have been conscientiously applied in recent as well as in old irreducible or unreduced dislocations. However, very sound judgment has to be exercised as to the degree of force to be used, lest more or less extensive tears take place in the muscles, vessels, nerves, and bones, forcing an operation at a great disadvantage.

The word irreducible is here adhered to, because it conveys the idea that all bloodless means have been attempted, but in vain, and that nothing remains to be done but to operate. Whereas the word unreduced may lead one to think that nothing at all has been done as yet.

There are fifty-seven forms and varieties of irreducible dislocations of the shoulder.

I. D, Recent, simple (all forward), 4 in number.

1. Treated by reduction (Stimson, 1890; Parmenter, 1891; Keener, 1894).
2. Treated by resection (Wyeth, 1895).

Complicated, 17 in number.

3. Complicated by having been subjected to violent efforts at reduction.

Complicated with fracture.

4. Forward dislocation, treated by reduction (Stemen, 1893, 2 cases); Porter, No. 1, 1893; McBurney, No. 1, 1894; Porter, No. 2, 1896; Berger, 1896; McBurney, No. 2, 1896; Bull, 1897).
5. Forward dislocation, treated by resection (Tripier, 1886).
6. Downward dislocation, treated by reduction (Wolfler, 1890–91).
7. Downward dislocation, treated by resection (Morton, T. G., 1884; Mauclair, 1889; Croft, 1891). Poirier and Mauclair, 1892; Clutton, 1892; Monks, 1895; McGraw, 1896).
8. Backward, treated by resection (Brinton, 1897).

I. D., Old and forward; 116 in number

9. Treated through anterior incision by reduction; 40 cases.
10. Treated through anterior incision by resection, 52 cases.
11. Treated through axillary incision by reduction; 1 case.
12. Treated through axillary incision by resection; 8 cases.
13. Treated through posterior incision by reduction; 2 cases.

14. Treated through subcutaneous sections (Swanzig); 5 cases.
15. Treated through subcutaneous osteotomy (Mears); 1 case.
16. Downward, treated through axillary incision by resection; 3 cases.
17. Downward, treated by osteoclasia, one case (Desprès).
18. Backward (in the adult), treated by resection; 2 cases.

Forms and varieties due to a useful limb, to age, number, and diseases.

19. With a useful limb.
20. Congenital; treated by reduction (all backward dislocations).
21. Congenital; treated by resection (all backward dislocations).
22. In young subjects.
23. In old subjects.
24. Double, *i. e.*, simultaneously of both shoulders.
25. Spontaneous or pathological.
26. Paralytic (myopathic); one case.

I. D. O. Forms and varieties due to complications.

27. Complicated by persistent atrophy of the muscles.
28. Complicated by fatty and sclerotic degeneration of the muscles.
29. I. D. O. In subjects rheumatic and gouty.
30. I. D. O. In subjects debilitated or affected with diseases at large or other injuries.
31. I. D. O. Which have been subjected to great efforts at reduction.
32. Complicated by arthritis, acute, of the pseudo-joint.
33. Complicated by arthritis, chronic or suppurative, of the pseudo-joint.
34. Complicated by anchylosis of the pseudo-joint.
35. Complicated by pressure symptoms of the vessels and nerves.
36. Complicated by fracture in attempting to reduce before operation.
37. Complicated by fracture in attempting to reduce during operation.
38. Complicated by injuries to the vessels and nerves in attempting to reduce before operating.
39. Complicated by injury to the vessels and nerves during the operation for resection or reduction.
40. Complicated by old fracture of the tuberosities, anatomical neck and surgical neck.
41. Complicated by old fracture of the shaft.
42. Complicated by a previous unsuccessful operation.

I. D. O. Forms and varieties due to recurrences (habitual dislocations).

43. Treated by suturing the capsule (reefing).
44. Treated by incision of the capsule and stitching.
45. Treated by excision of part of the capsule and stitching.
46. Treated by reduction and stitching the head in the glenoid cavity.
47. Treated by resection of the head.

I. D. O. Forms and varieties due to the sequels of the operation.

48. I. D. O., operated by reduction or resection and followed by long suppuration.
49. I. D. O., operated by resection or reduction, and followed by necrosis of the bone.
50. I. D. O., operated by ***reduction***, and followed by ***anchylosis*** of the head ***in the old glenoid cavity.***
51. I. D. O., operated successfully by ***reduction***, and followed by recurrence and ***anchylosis in the pseudo-cavity.***

52. I. D. O., operated by *resection* and followed by *anchylosis of the sectioned extremity of the humerus* in or near the *glenoid cavity*.

53. I. D. O., operated by *resection*, and followed by *dislocation of the sectioned extremity* of the humerus, under or inside of the coracoid process.

54. I. D. O., operated by *resection*, and followed by *anchylosis of the sectioned extremity* of the humerus under or inside of the coracoid process.

55. I. D. O., operated and followed by anchylosis of the pseudo-joint.

56. I. D. O., operated and followed by dry arthritis of the pseudo-joint.

57. I. D. O., operated by resection, and followed by a dangling limb.

All the last forms are most frequently mentioned in connection with dislocations forward, because they are the most common of all dislocations; the others are comparatively rare.

Guide.—Each operated case presents to study the diagnosis or kind of dislocation, its duration or time of standing, the condition of the muscles of the limb, shoulder, arm, forearm, hand; extent of each movement without or with participation of the scapula, paresis, paralysis, atrophy, weakness, electrical reaction; of the artery, as revealed by the radial pulse; of the veins, by the œdema of the hand or forearm; of the nerves, by anæsthesia or pains; the operation performed; the difficulties and complications during the operation; the complications after the operation; the results immediate, the results remote or final; the remarks and the references.

IRREDUCIBLE DISLOCATIONS, RECENT AND SIMPLE.

We will call recent all dislocations no older than a month: this is somewhat arbitrary, but adopted to fix a limit.

1. *I. D.: recent, simple, and forward, treated by arthrotomy and reduction through an interior incision*, are three in number, reported by Stimson, 1890; Parmenter, 1891; Keener, 1894. See Cases I., II., III.

The duration of the dislocation was two days (Stimson), one week (Parmenter), four hours (Keener). In Stimson's case the head was arrested by the tendon of the subscapular, which was sectioned and reduction easily effected; in Parmenter's case the tendon of the two spinous and of the subscapular muscles had to be divided, and even then the reduction is difficult. Complications following the operation were totally absent in the three cases. All report primary union. The results remote are only

fair in Parmenter's case, good in Stimson's, and very good in Keener's. Therefore, the early interference in these cases is favorable.

2. *I. D.; recent, simple and forward, treated by resection* through an anterior incision, is represented by the single case of Wyeth, 1895. It was twelve days old. Through an anterior incision, McBurney's hooks were inserted in three different places, but without avail, and the head had to be resected. Severe shock followed, and death resulted in twelve hours. As far as this single case goes, it seems to show that resection is a more severe operation.

3. *I. D.; recent, complicated by fracture, and having been subjected to violent efforts at reduction*, should not be operated until the inflammation has abated, lest we might fall into bruised and lacerated tissues, which would more easily suppurate and thus give rise to a double compound condition, the open joint and the focus of the fracture.

4. *I D.; recent, complicated by fracture below the head and forward, treated by an anterior incision with arthrotomy and reduction*, has been recorded by Stemen, 1893, two cases; Porter (C. B.) two cases, 1893 and 1896; McBurney, two cases, 1895 and 1896; Berger, 1896; Bull, 1897. (See Cases V. to XII.)

The duration was a few hours in one of Stemen's cases, nine days and one month in Porter's two cases, two weeks in McBurney's, sixteen days in Berger's, two days in Bull's. All used an anterior incision down to the bone; Stemen seized the end of the upper fragment with lion-jawed forceps; in one case, Porter drilled a hole in the bone in the head and inserted a hook. McBurney inserted a peculiar hook of his invention. Berger seized the tuberosities with strong forceps (davier Farabeuf). Bull tried McBurney's hook, but had to pry the head in place with a periosteal retractor. No difficulties nor complications were experienced by Stemen, McBurney, and Bull; bu
states that he had to pull with great force to dise
and bring it in the glenoid cavity; he ment
the tuberosities. Porter (No. 2) removed a
and stitched the head to the shaft. McB

to the tuberosities and shaft with catgut. No sutures through the bones were thought necessary in the other cases to insure proper adjustment of the fragments. No complication followed the operation, and primary union took place, except perhaps in Berger's case, where it is not stated, and in Porter's No. 2, where long suppuration followed and the head had to be removed. The remote result was only fair in Berger's case, good in Stemen's and Bull's, very good in Porter's No. 1 and in McBurney's; improved only in Porter's No. 2. The conclusion is that various instruments, therefore, can be used carefully to replace the head in obstinate cases, and that suturing may give a good result.

5. *I. D.; recent, complicated by fracture below the head and forward, treated by resection*, is recorded only once by Tripier. (See Case XIII.) It was thirteen days old; there was a comminuted fracture, with pieces wedged in between the humerus and the glenoid cavity, together with a fracture of the surgical neck. A serious complication at large was an aortic insufficiency with a hypertrophied heart. The union was secondary, and the convalescence delayed and interfered with by the circulatory disturbances just mentioned. The final result was only fair.

6. *I. D.; recent, complicated by fracture of the head, with dislocation of the head in the axilla treated by reduction*, is represented by the unique case of Wolfler. (See Case XIV.) He pegged the head back and reduced it. No difficulties or complications are reported; no complications are noted as following the operation; the union was primary and the final result good. McCormac says that Helferiot also used the peg, but he gives no reference. It is noticeable that the head loose in the axilla has never been known to become necrotic (McCormac). The danger of such procedures is the consequent callus causing more or less limitation of movement, if it be large and irregular.

7. *I. D.; recent, complicated by fracture of the head, with dislocation of the head in the axilla, and treated by resection or removal*, are comparatively numerous, reported by Morton, T. G., 1884; Mauclair, 1889; Croft, 1891; Poirier and Mauclair, 1892; Clutton, 1892; Monks, 1895; and McGraw 1896. (See Cases XV. to XXII.) The duration or standing of the injury is laid

down as recent (Morton and Croft); eight days, Clutton; four hours (Monks); four weeks (Poirier and McGraw), all were operated by an axillary incision and by resection—*i. e.*, by removal of the dislocated head; all without serious difficulty. McGraw notes also a second fracture below the tuberosities. No complications followed the operation, and primary union is noted in all cases, all recovered with a final result good in Croft's, Clutton's, Poirier's and McGraw's; Monk's case died, apparently of shock. Clinical experience, therefore, is in favor of the removal of the head in such cases.

8. A case of *I. D., recent, and backward (subspinous), complicated by fracture of the head*, is reported by Briddon. (See Case XXIII). The head was resected—*i. e.*, removed, and the extremity of the fragment smoothed and brought into the socket. The wound suppurated, but the final result was satisfactory.

REMARKS.—Stimson condemns open arthrotomy when a recent fracture is present[7a], also condemns primary excision of upper fragments; he says to wait until the inflammatory and reparative processes have ceased, then remove the upper fragment if it seems advisable[7]. In view of the results above recorded a more modern opinion was solicited from so high an authority. The courteous answer was as follows: "The opinion expressed on page 257 is, I still think, sound, although added experience and improved technique have diminished the risk incurred by operating under the conditions mentioned. I still think that arthrotomy through torn tissues infiltrated with blood and inflammatory exudates is hazardous, because of the chance of suppuration, and I think the special risk begins and increases after the first or second day. I do not condemn the early operation or primary excision when indicated; I have practised both and with success, but I here warn against the risks of what may be called the tardy early operation, cutting into swollen discolored tissues about severe injuries after the second day. The statement first referred to needs now to be supplemented by mention of McBurney's brilliant method of reducing the dislocated upper fragment, in which, by the way, the incision does not open the joint or pass through torn tissues."[8]

The following remarks from McBurney's valuable contribution are worthy of note:

Surgeons have been agreed that whenever fracture and dislocation of the same bone has occurred, the dislocation should first be reduced if possible.[9]

We must here again recall the important rule not to operate before trying to reduce, and the following remarks of McBurney are most timely:

When the fracture is near the head the heel process is useless and dangerous.[10]

Manipulations by pressure with the thumbs and fingers on the head are most infrequently successful.[11] They succeeded in 36 out of 80 cases.[12]

Failing to reduce, some surgeons have treated the fracture until firm union had taken place, and, using the repaired shaft for extension, rotation, or leverage, endeavored to reduce.[13] Three cases out of ten are reported as successful, but not without criticisms.[14]

Riberi practised passive movements to establish a false joint at the point of fracture.[15] It may succeed where the fracture is high up and the lower fragment has been raised by muscular contraction outside the upper one and near to the glenoid cavity.[16] Seven cases are reported as successful, but there are no details as regards movements, pain, or disability caused by the dislocated head.[17]

Reduction by open arthrotomy and subsequent treatment of the fracture is preferable to resection of the fractured head, because it offers the prospect of a more nearly perfect final result than the other plan.[18]

In case of reduction the bones should be sutured.[19]

If union fails resection should be made at once.[20]

If reasons exist for not performing the operation of open arthrotomy and reduction, the resection of the head might well be left for subsequent consideration, and then, after all acute symptoms had subsided, be resorted to in case sufficient pain or disability existed to call for this secondary operation.[21]

It has occurred to me that the hooks might be useful in some

cases of old dislocation of the humerus in applying counterextension to the scapula—*i. e.*, by applying also a hook at the base of the spine of the scapula.[22]

HISTORIES OF CASES OF IRREDUCIBLE DISLOCATIONS OF THE SHOULDER, RECENT AND SIMPLE.

CASE I. *1890, Stimson (Lewis A.).*[23] I. D., recent, simple forward (left intra-coracoid), anterior incision, arthrotomy, reduction; result good.

Man, aged 53 years. *Diagnosis:* Forward intracoracoid. *Duration:* One day. *Movements*, etc.: Arm powerless and much swollen. *Operation:* Anterior incision exposing the joint. *Difficulties*, etc.: The head of the humerus lay well to the inner side, and its neck was crossed in its outer side and above by the untorn tendon of the subscapular muscle; after division of this muscle the head was easily returned to its place. *Complications after operation:* None. *Result immediate:* Wound healed primarily. *Result remote:* Nine months after abduction was retarded more on the left than on the right side; rotation almost complete; backward and forward movements about half; patient at work running an elevator. *Remarks:* There was also at the same time a dislocation of the right shoulder, but it was reduced without operation.

CASE II. *1891. Parmenter (John).*[24] Recent, simple, forward (intracoracoid), anterior incision, arthrotomy, reduction; result fair.

Man, aged 50 years. *Diagnosis:* Intracoracoid. *Duration:* One week. *Movements*, etc.: Great deviation of the arm from the normal; unusual fixity in that position. *Operation:* Incision four or five inches long through the anterior border of the deltoid; capsule reached, opening of the joint. *Difficulties and complications:* Neck tightly grasped by the capsule, the supra- and infraspinous muscles; subscapular very tense; long tendon of biceps lay tensely stretched across the greater tuberosity, it having been thrown out of its groove; hole in the capsule enlarged, and an attempt made at reduction; not until the subscapular and the spinous muscles were divided at their insertions, was reduction possible, and then only with difficulty. *Complications after the operation:* Fever, redness, etc., but no pus. *Result immediate:* Primary union; at the end of three weeks passive motion was begun. *Result remote:* He gradually came to using his arm freely in all directions, except raising it to a right angle, owing to the paralysis of the

deltoid. Six months later, no improvement in the deltoid movements; very little grating in the joint; atrophy of the deltoid comparatively little. *Remarks:* None.

CASE III. *1894. Keener (W.).*[25] Recent, simple forward (intracoracoid), anterior incision, arthrotomy, reduction, result good.

Man, aged 22 years. *Diagnosis:* Intracoracoid dislocation. *Duration:* Recent, reduction attempted immediately after accident, after which, failing, operation was performed. *Movements*, etc.: ? *Operation:* An incision was made over the pectoralis major, which, being drawn downward, revealed the head of the bone deep between the pectoralis major and minor. The capsule was not ruptured, but seemed to be pushed before the head of the bone, while, closely hugging the anatomical neck, both anteriorly and posteriorly, were large, firm, cord-like bundles of fibres reinforcing the ligament proper. The anterior was the heavier of the two. Both the humeral and scapular attachments were divided with a scalpel, and the bone went easily into place. Wound closed and sealed with collodion. *Difficulties and complications of operation:* None. *Complications after the operation:* ? *Result immediate:* No fever, primary union. *Result remote:* The limb finally as good as before. *Remarks:* Patient says the shoulder had been once before dislocated when a mere child.

CASE IV. *1895. Wyeth (J. A.).*[26] Recent, simple, forward (subcoracoid), anterior incision, resection, death.

Man, aged ——. *Diagnosis:* Subcoracoid dislocation. *Duration:* 12 days. *Movements*, etc.: ? *Operation:* Incision; the upper fragment of the humerus is exposed; drilled three different holes in it to insert McBurney's hooks. *Difficulties and complications of operation:* No amount of force in any direction could reduce the dislocation; finally, had to resect the head and put the arm in ordinary splints. *Complications after the operation:* Severe shock. *Result immediate:* Patient died in twelve hours. *Remarks:* ?

HISTORIES OF CASES OF IRREDUCIBLE DISLOCATIONS, RECENT AND COMPLICATED.

CASE V. *1894. Stemen, (C. B.).*[27] Case V. I. D., recent, complicated, and forward, with fracture of the surgical neck; incision to the bone, reduction, result good.

Man, aged 30 years. *Diagnosis:* Forward dislocation, with fracture about three inches below the joint. *Duration:* A few hours. *Move-*

ments, etc.; Nothing special. *Operation:* Cut down through the soft parts and then grasped the end of the bone with a strong lion-jawed forceps; reduction with but little difficulty. Fracture reduced and treated as a compound fracture. *Difficulties and complications of operation*: None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Good. *Remarks:* It is the first time that such procedure was done.

CASE VI. *1893. Stemen* (*C. B.*).[28] Similar case and good results.

CASE VII. *1893. Porter* (*Charles B.*).[29] No. 1. I. D., recent, complicated, forward (subcoracoid) with fracture of surgical neck; V incision, insertion of hook, reduction, result very good.

Man, aged 54 years. *Diagnosis:* Subcoracoid dislocation, with fracture of the surgical neck; *i. e.*, axillary, subspinous. *Duration:* Nine days. *Movements*, etc.: ? *Operation:* On *November 18, 1893*, V-shaped incision over shoulder through deltoid into the joint. *Difficulties and complications of the operation:* Found comminuted fracture of the surgical neck; removed two fragments of bone the size of a quarter, and removed smaller fragments. Drilled a hole in head of the bone, and inserting a strong hook into the hole, pulled the head back into the glenoid cavity; when the head got to the edge of the glenoid cavity it slipped into it easily and in good position. *Complications after the operation:* Stains through the plaster; a window in the plaster; redness, suppuration. *Result immediate:* Was discharged relieved on the fifty-second day. *Result remote:* Six months later very good motion; says arm is just as good as before the injury. There is some atrophy of the deltoid.

CASE VIII. *1894. McBurney* (*Charles*).[30] Recent, complicated forward, with fracture; anterior incision, reduction, result good.

Man, aged 45 years. *Diagnosis:* Subcoracoid dislocation, with fracture below the head. *Duration:* Two weeks. *Movements*, etc: None possible. *Operation July, 1893:* Incision about one and a half inches long, beginning about one inch below the acromion, through the deltoid muscle to the outer surface of the upper fragment; hole drilled completely through the very obliquely bevelled bone; insertion of a special hook as far as it would go; forearm and upper arm then slowly carried outward and nearly to a right angle with the body; with the powerful hook in the right hand and fingers of the left hand on the head of the humerus, vigorous traction is made in the same direction; effort required, very considerable, but no change of direction needed; reduction accomplished at first attempt; apposition of the fragments

then was so very perfect that suturing of bones not deemed necessary; two deep catgut sutures were passed through the soft parts immediately overlying the bone. Arm brought close to the chest without displacing fragments; wound closed with catgut, with drainage; sterile dressing, plaster-of-Paris bandage. *Difficulties and complications of operation:* None. *Result immediate:* Primary union; after a week in bed patient was able to walk about, using a sling to support the heavy bandage. On twenty-fourth day, firm union; moderate passive movements of the shoulders. *Result remote:* From fifth week, passive movements and massage daily; on seventh week patient able to return home without apparatus of any kind; voluntary movements of shoulder-joint satisfactory. Four months after operation voluntary and passive movements as good as those of the other side, no atrophy of muscle, no deformity at point of fracture; patient claims that the use of arm is as good as before injury. *Remarks:* None.

CASE IX. *1896. Porter* (*Charles B.*) No. 2.[31] Recent, complicated, forward, with refracture of surgical neck; anterior incision, reduction, stitching of head to the shaft, later resection, result improved.

Woman, aged 50 years. *Diagnosis:* Subcoracoid dislocation with fracture of head of humerus, swelling and ecchymosis. *Duration:* One month. *Movements*, etc.: No paralysis. *Operation:* Attempt to reduce by Kocher's method, etc., but of no avail; forcible rotation of the arm produced refracture of the partially united fracture, probably of the surgical neck. Next day incision six inches long on top of the shoulder, running down four inches below top of acromion, carried through deltoid to the bone. *Difficulties and complications of the operation:* Oblique fracture of the surgical neck running up through the tuberosities, which were comminuted. Head of bone not to be seen; searched for it, found it driven in beneath the coracoid process and tightly wedged there; attempt to dislodge it with hooks and forceps unsuccessful, though much force is used; surrounding tissues separated and further attempts made, but the head remained fixed. Biceps tendon found to be holding head down, so it is cut; head then drawn into its normal position with much force, when sudden very profuse hemorrhage from the wound; blood dark-colored; wound at once tightly packed with gauze and sponges; hemorrhage stopped. Removal of comminuted pieces of bone; head stitched to the shaft by silver wire. *Complications after the operation:* Suppuration. *Result immediate:* Long suppuration, head resected—*i. e.*, re-

moved. *Result remote:* One year after, still fistulous tracts; patient is able to reach his head with the hand.

CASE X. *1896. Berger (P.).*[32] I. D.; recent, complicated forward, with fracture; anterior incision, arthrotomy, reduction with forceps, result poor.

Sex?; age? *Diagnosis:* Intracoracoid luxation. *Duration:* Sixteen days. *Movements,* etc.: ? *Operation:* Deltoid incised along the anterior edge of the glenoid cavity; capsule freely incised; after dislocation was reduced the capsule was stitched up, and also deltoid and skin. *Difficulties and complications of the operation:* Glenoid cavity was free, but the articular capsule was tensely stretched between the head of the humerus and glenoid cavity; reduction of the head very hard, because the head had penetrated so far under the pectoralis major. The head had to be seized by the tuberosities with forceps, "davier Farabeuf," and pulled with great force in order to disengage it and bring it into the glenoid cavity; there was a fracture of the upper end of the humerus, but the fragments were in apposition, and it was not necessary to unite them by an osseous suture. *Complications after the operation:*? *Result immediate:*? *Result remote:* improved; three months after the operation the patient could bring his hand to his face and carry the elbow to the height of the shoulder; these movements were partly due to the mobility established between the shoulder-blade and body. *Remarks:* Ten days after the accident attempt at reposition under chloroform failed.

CASE XI. *1896. McBurney (Charles).*[33] I. D.; recent, forward (subcoracoid) with recent refracture through the anatomical neck; anterior incision, reduction, suture of bones, result very good.

Man, aged 28 years. *Diagnosis:* In attempting to reduce by Kocher's method, before the outward rotation of the humerus had been half complete, marked crepitus was felt, and the effort at reduction stopped; partial union between the fragments had occurred. *Duration:* One month. *Movements,* etc.: Great pain and disability. *Operation:* Straight incision from top of acromion downward for three and a half inches through the anterior portion of the deltoid muscle to the bone throughout. Separation of the soft parts with retractors revealed the line of fracture; it was accurately through the anatomical neck. By rotation of the humerus the fracture could be readily and widely opened, and the evidence of former partial union was clear. Head of the bone lay deeply imbedded in the coracoid position; a slight extension of the incision upward and inward allowed the outer

portion of the head to be seen. The drill was applied at a point a quarter of an inch from the edge of the fracture, so passing first through the articular surface. The hook was then inserted and, while the humerus was held away from the body, traction was made on the head outward and forward. *Difficulties and complications of the operation:* Feared to apply great force lest the cancellous tissue of the head should give way, and at the first attempt only succeeded in lifting the head a short distance. The second attempt resulted in a similar manner. At the third effort I used more power and would feel the head of the bone rise more than an inch from its abnormal position. At the same time one of my assistants pushed vigorously with the fingers on the head of the bone and toward the glenoid cavity, and reduction was effected with entire success. The fragments were now sutured together with catgut, the fractured surfaces meeting very accurately. The wound in the soft parts and into the skin was closed with catgut, and a drainage-tube inserted at the upper and lower end of the wound. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Slight passive movements were begun at the beginning of the fifth week, and continued and increased almost daily for seven weeks from the day of the operation. At that time motion at the point was perfectly smooth in character; the hand could grasp completely the shoulder of the sound side, the forearm could be actively passed behind the back until the upper arm touched the thorax. The hand could be actively passed behind the head and the arm elevated to a right angle with the body. *Remarks:*?

CASE XII. *1897. Bull (W. T.).*[34] I. D.; recent, forward, complicated by fracture of the head, anterior incision, arthrotomy, reduction, result good.

Boy, aged 15 years. *Diagnosis:* Subcoracoid or axillary; the head was fully in the axilla; the arm from acromion to epicondyle is shorter by three-quarters of an inch than the other; soft crepitus on rotation; head could be felt immovable in the axilla. *Duration:* Forty-eight hours. *Movements,* etc.: Shoulder much swollen; deltoid rigid. *Operation:* Longitudinal incision through the fibres of the deltoid just internal to the acromion, exposing the seat of fracture and capsule of the joint; the upper epiphysis, consisting of head and tuberosities, was separated from the shaft, but held in close contact by periosteum and fascia; head fully in the axilla, no displacement relative to the shaft; division of the capsule; head was pried into place with a periosteal retractor; anterior or outer part of wound closed over an iodo-

form tampon, which rested on head of the humerus; a second one was placed in a counter-opening posteriorly, also leading to within the capsule. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Moderate wound reaction. *Result remote:* In two and a half months all wounds were healed; at the end of eight months has, for practical purposes, good use of the hand and arm, no shortening, no atrophy, though just below the acromion the fulness of the deltoid is less marked than on the other side, moderate stiffness, head of bone clearly in place, rotation possible to about one-half its normal extent, abduction about three-quarters of the way to the right angle (horizontal position); movement of the scapula complete, and the range of motion but a trifle short of that possible on the sound side. *Remarks:* None.

CASE XIII. *1886. Tripier.*[35] I. D.; recent, forward, complicated by fracture of head and surgical neck, anterior incision, resection, result fair.

Sex, male; age, 49 years. *Diagnosis:* Subcoracoid luxation, with fracture of head of humerus. *Duration:* Thirteen days. *Movements*, etc.: Loss of power in arm, sharp pain around upper end of arm. *Operation:* An incision ten centimetres long running from coracoid apophysis downward in direction of the insertion of deltoid with pectoralis major; cephalic vein turned inward, capsule previously not torn, opened; head cannot be replaced and is extirpated; counter openings, drainage, antiseptic dressing. *Difficulties and complications of the operation:* These depended mostly upon a number of small fragments of bone which were caught between the head and the glenoid cavity, and could not be removed until the head was resected; they completely hindered any reduction of the head; the capsule was found filled with blood when opened; the greater tuberosity had been broken off, and the fragments of the bone found were portions of the glenoid cavity; there was a fracture of the surgical neck. *Complications after the operation:* None dependent on the operation. *Result immediate:* Secondary union, convalesence delayed and interfered with by circulatory disturbances. *Result remote:* Three months after operation movements of arm good, adduction somewhat limited; the movements forward and backward are good; in abduction, patient can put his hand on the healthy shoulder; arm hangs normally, but is a little separated at the elbow from body; raises his hand easily to mouth; movements of circumduction like the rest, fair; rotation very limited. *Remarks:* Shoulder was very much swollen, and there was a large

ecchymosis extending almost to elbow; attempt at reduction was made two days before the operation, but was unsuccessful. Patient had aortic insufficiency and a hypertrophied heart.

CASE XIV. *1890–91. Wolfler.*[36] I. D.; recent, complicated, downward (in axilla) of fractured head through anatomical neck; axillary incision; "pegging" of the fragments, reduction, result good.

Man, aged ——. *Diagnosis:* Fracture of the head through anatomical neck, head loose in axilla. *Duration:* Recent. *Movements*, etc.: ? *Operation:* Axillary incision "pegging" of the head, reduction. *Result immediate:* Primary union. *Result remote:* Fair. *Remarks:* ?

CASE XV. *1884. Morton (Thomas G.).*[37] I. D.; recent, complicated, downward (in axilla) with fracture through anatomical neck; axillary incision; resection; death.

Male, aged 73 years. *Diagnosis:* Fracture through anatomical neck of the humerus, with complete separation and dislocation of the head of the bone into the axilla. *Duration:* ? *Movements*, etc.: Preternatural mobility of the joint, but crepitation not marked. *Operation:* After a number of vigorous efforts at reduction without success, the head of the bone in the axilla was removed by a small incision at the lowest part of the axillary region. The wound was brought together by silver sutures, and the arm bound to the chest. *Complications after operation:* The patient was in a condition to leave the hospital thirteen days after the operation, but on the fourteenth day he was taken with severe diarrhœa, with great exhaustion, which terminated fatally a week later. *Result:* Death. *Remarks:* The humerus showed considerable absorption and rounding off at seat of fracture.

CASE XVI. *1889. Mauclair.*[38] I. D.; recent, complicated, downward (in axilla of fractured head through anatomical neck), axillary incision, resection—*i. e.*, removal of head, result not stated.

Man, aged 63 years. *Diagnosis:* Head felt in axilla. *Duration:* Twenty-four days. *Movements*, etc.: Deltoid atrophied; tickling in the fingers. *Operation:* Axillary incision. *Difficulties and complications of operation:* Head deeply seated, adhering to the inner surface of the shaft; impossible to reduce head; head detached by the fingers from the shaft; head seized with bone forceps and removed easily; upper extremity of humerus kept well opposite the glenoid cavity. *Complications after operation:* ? *Result immediate:* ? *Result remote:* ?

CASE XVII. *1889. Wattson's* case, reported by McLaren.[39] I. D.;

recent, forward (subcoracoid), anterior incision, fracture of greater tuberosity, reduction with a scoop, result good.

Man, aged 40 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Four weeks. *Movements*, etc.: ? *Operation:* Incision of about eight inches long was made over the interval between the deltoid and clavicular portion of the pectoralis major; capsule found torn completely away; finger encountered first the glenoid cavity and then a rough surface on the head of the humerus. This proved the spot from which a piece of bone, comprising the two upper parts of the greater tuberosity, had been broken off; a fragment was found attached to the under surface of the tendons, which are inserted into it, and was lying at a little distance from, not in, the glenoid cavity; biceps tendon was in position, head of humerus lay under the coracoid process. *Difficulties and complications of the operation:* Dr. Watson inserted a narrow lithotomy scoop into the wound, and passing it to the inner side of and beneath the head, succeeded in levering it up into the glenoid cavity; a drainage-tube was inserted, wound stitched and dressed. *Complications after the operation:* About a week after the operation patient's mind began to wander, and he became subject to delusions, etc., but under proper treatment this symptom gradually passed away. *Result immediate:* Wound healed in a week's time. *Result remote:* Eight weeks after operation passive motion was begun. Eight months after the operation, patient can touch top of his head, opposite shoulder, back of hip on same side. He can abduct the arm from the side 70°, but has very little power of external rotation. It is interesting to note that supination is impaired. *Remarks:* Patient had gone to bed about twelve o'clock, feeling well (before the operation), and two hours later woke up with pain in shoulder, and unable to move his arm; no accident or cause known for the dislocation.

CASE XVIII. *1891. Croft.*[40] I. D.; recent, downward (in axilla), with fracture through anatomical neck; axillary incision, resection, result good.

Man, aged 33 years. *Diagnosis:* Axillary dislocation of head of humerus, which was fractured through the anatomical neck; a hard semi-globular mass was felt lying in the axilla; extensive ecchymosis. *Duration:* Three days. *Movements*, etc.: Has hardly any power in forearm and fingers, all movements are affected. *Operation:* Incision along the anterior fold of the axilla; dissecting through the tissues infiltrated with blood; the head of the bone was found lying loose just

below the glenoid cavity; the nerve-cords and the axillary vessels were roughly separated from the tissues; the fracture was almost through the anatomical neck; the jagged upper end of the shaft was trimmed with bone forceps. *Difficulties and complications of the operation:* ? *Complications after the operation:* ? *Results immediate:* Primary union. *Result remote:* improved.

CASE XIX. *1892. Poirier and Mauclair.*[41] I. D.; recent, complicated, downward (in axilla, of fractured head through anatomical neck), axillary incision, resection—*i. e.*, removal of head, result very good.

Sex ?; aged 37 years. *Diagnosis:* Head easily felt in axilla. *Duration:* Recent. *Movements*, etc.: ? *Operation:* Axillary incision, removal of head, extremity of the humerus kept well opposite the glenoid cavity. *Difficulties and complications of the operation:* None. *Complications after operation:* None. *Result immediate:* Primary union. *Result remote:* Three months after accident, patient can move his arm to the horizontal; almost forward and backward; does movements of circumduction pretty extensive, all active movements; he can raise his hat with his hand.

CASE XX. *1892. Clutton (N. H.).*[42] I. D.; recent, complicated, downward (in axilla) with fracture of head; axillary incision; resection; result good.

Female, aged 61 years. *Diagnosis:* Dislocation of head of humerus with fracture of the anatomical neck. *Duration:* Eight days. *Movements*, etc.: Could not move the arm herself; the shaft of the humerus could be moved in all directions without moving scapula. *Operation:* Incision was made into the axilla, and the head of the humerus was exposed. *Difficulties and complications of operation:* Head fractured through anatomical neck; it is lifted out of the wound without use of knife or scissors; the finger was introduced and passed readily through a large opening into the joint; the capsule on the distal side felt rough and bony; greater tuberosity torn off from the shaft; finger was easily swept around the upper end of the bone, except at the lesser tuberosity. *Result immediate:* Wound healed by first intention; no passive movements employed, but the patient was encouraged to use her shoulder as much as possible in various ways. *Result remote:* Eight months after operation she can put her hand to the back of her head, to her mouth, and to the top of the opposite shoulder, also behind the back; shoulder rather fixed in raising the arm from side. *Remarks:* The specimen, now in St. Thomas' Hospital

Museum, comprises the entire head of the humerus, the line of fracture following the margin of the articular surface for two-thirds of the circumference of the bone, whilst the remaining third has encroached upon the tuberosities to the extent of three-quarters of an inch from the articular margin.

CASE XXI. *1895. Monks (G. H.).*[43] I. D.; recent, complicated, downward (in axilla), with fracture of the head; axillary iucision, removal of head; death.

Man, aged ? years. *Diagnosis:* Dislocation of the shaft below the tuberosities; the detached head became displaced and wandered into axilla, where it could be felt easily when the man entered the hospital; the fractured surface rested against the thorax. *Duration:* A few hours. *Movements,* etc.: ? *Operation:* It was obviously impossible to put back the bone by manipulation; incision made into the axilla down to the ruptured fragments. *Difficulties and complications of the operation:* The head was entirely free except for a tendon attached to a part of the greater tuberosity, that tendon proved to be that of the subscapular muscle, a fact which explains why the head was drawn inward into the axilla and could not be returned to the glenoid cavity; in the wound it seemed impossible to return the fragments to their proper place. *Complications after the operation:* All did well for two days, when abdominal distention appeared, as well as other serious symptoms, and the man died four days after the operation; the autopsy could not determine the cause of death. There was also a fracture of the greater tuberosity. *Result immediate:* Primary union. *Result remote:* Death. *Remarks:* None.

CASE XXII. *1896. McGraw (Th.).*[44] I. D.; recent, complicated, downward, complicated by fracture of the head; axillary incision—*i. e.*, removal of head, result good.

Man, aged 45 years. *Diagnosis:* Dislocation of head, fractured through anatomical neck; in the axilla could be plainly felt a hard, round body, which only could be the head of the humerus. *Duration*: Four weeks. *Movements,* etc.: Elbow far from the side. *Operation:* Incision through the deltoid three inches long, and joint exposed. *Difficulties and complications of operation:* Bone broken through anatomical neck, and completely detached and displaced into axilla. Also a second fracture below the tuberosities, passing diagonally through the bone from before and above, downward, outward, and backward; the upper end of the lower fragment projected on the inner side of the arm, crowding the upper fragment; endeavored to reach the de-

tached head, but combined muscular tension and inflammatory deposits made it impossible without extensive dissection and detachment of muscle; the supra and infraspinous and subscapular held the upper fragment firmly against the acromion; lower fragment was pulled as firmly against the upper. Axillary incision, opening of the capsule, removal of head; although completely detached, it is firmly held between the capsule and the neighboring bone; there is considerable difficulty in removing it. *Complications after operation:* None. *Result immediate:* Primary union. *Result remote:* Thirteen months after he has perfect use of arm, could lift it nearly at right angles with the body, suffers no inconvenience from arm whatever. *Remarks:* None.

CASE XXIII. *1897. Brinton (J. H.).*[45] I. D.; recent, backward (subspinous) complicated by fracture of head of humerus, acromio-humeral incision; resection of head, improved.

A girl, aged ? *Diagnosis:* X-rays showed subspinous dislocation of head with transverse fracture of humerus below the tuberosities. *Movements*, etc.: ? *Duration:* Three days. *Operation:* Acromio-humeral incision through deltoid to the bone; head removed above the line of fracture, which was practically at the epiphyseal junction; upper end of lower fragment smoothed off; deltoid incision sewed up with kangaroo tendon by continuous suture; drain; skin is sutured by silkworm gut. *Difficulties and complications of the operation:* ? *Complications after the operation:* ? *Result immediate:* Suppuration; gradually healed. *Result remote:* Two months later, patient is discharged; motions of false joint returning satisfactorily. *Remarks:* ?

TABLE OF DIFFICULTIES, COMPLICATIONS, AND RESULTS OF IRREDUCIBLE DISLOCATIONS, OLD, SIMPLE, AND FORWARD, OPERATED THROUGH AN ANTERIOR INCISION.

I. D. O. Forward, treated through an anterior incision by arthrotomy and reduction.	*I. D. O. Forward, treated through an anterior incision by arthrectomy or resection.*
Difficulties and Complications of the Operation.	*Difficulties and Complications of the Operation.*
1. *Capsule thick*, 10 per cent.: Garmany, 1888. Schede No 2, 1892. Poncet, 1893. Souchon, 1895.	
2. *Dissection tedious*, 8 per cent.: Severeano, 1892. Pollosson, No. 5, 1893. Ransohoff, 1897.	2. 2 per cent.: Weinlechner, 1876.
3. *Reduction difficult*, 24 per cent.: Wattman, 1820, used a lever. Lister, 1873, Nos. 1 and 2, used pulleys in both cases. Albert, 1874, used two steel hooks. Schonborn, No. 1, 1885. Watson, 1889, used a lithotomy scoop as a lever. Gould, 1891, used pulleys and a raspatory as a lever. Cheyne, 1891. Cotterill, No. 1, 1892. Cotterill, No. 2, 1893.	3. 12 per cent.: Langenbeck, 1862. Reid, 1880. Thornburn, 1891, head difficult to remove. Gwyer, 1891, head difficult to remove. Delbet, 1893, head difficult to remove, gouged and sawed through anatomical neck. Porter, 1894, head hard to remove.
4. *Excessive fibrous tissue* around head and surgical neck, 13 per cent: Burckhardt, 1878. Bruns, 1877, very extensive. Wolfler, 1890. Cheyne, 1891. McCormac, 1893.	4. 28 per cent.: Paget, 1868. Thiersch, 1874. Annandale, 1875. Hofmokl, 1881. Ollier, 1886. Sheild, 1888. Kocher, No. 8, 1889, adhesions also on cartilage of head. Gwyer, 1891. Delbet, 1893. Lizars, No 2, 1895. Bickham and Souchon, 1895. Boone, 1896. Chénieux, 1896. Erdmann, 1896.
5. *Head deeply seated.*	5. No per cent.: Sheild, 1888. Gwyer, 1891, head resting on ribs. Porter, 1894.
6. *Head adherent to ribs.*	6. 2 per cent.: Annandale, 1875, removed piecemeal.
7. *Extensive muscular incisions*, 16 per cent.: Wattman, 1820. Lister, No. 2, 1873. Gould, 1891. Schede, No. 1, 1892. Cotterill, No. 1, 1893. Cheyne, 1893.	
8. *Old fracture of great or small tuberosity* not united to the bone, 10 per cent.: Burckhardt, 1878, great tuberosity removed. Pfeiffer, 1886, not removed. Blasius, 1886, small tuberosity removed. Watson, 1889.	
9. *Old fracture of great or small tuberosity united to bone*, 8 per cent.: Gurlt, 1886, great tuberosity removed. Bruns, 1857, removed. McCormac, 1893.	9. 24 per cent.: Langenbeck, 1858, great tuberosity. Langenbeck, 1862, small tuberosity. Reid, 1872, great tuberosity. Pfeiffer, 1886, great tuberosity. Finckh, 1889. Kocher, No. 2, 1889, great tuberosity. Kocher, No. 4. 1889. Kocher, No. 5, 1889. Kocher, No. 6, 1889. Kocher, No. 8, 1889, great tuberosity. Robson, 1890, great tuberosity. Thornburn, 1891.
10. *Old fracture of anterior part of the glenoid cavity* united or not to the bone, 8 per cent.: Wattman, 1820. Cotterill, No. 2, 1893. McCormac, 1893.	10. 2 per cent.: Kocher, No. 3, 1889.
11. *Old fracture of humerus united*, 3 per cent.: Bruns, 1887, surgical neck.	11. 8 per cent.: Kocher, No 2, 1889, anatomical neck. Kocher, No. 5, 1889, anatomical neck; the fracture was refractured during attempt to reduce Erdmann, 1896, same. Veer, 1897, same.
12. *Glenoid cavity normal*, 10 per cent.: Severeano, 1893. Poncet, 1893. Souchon, 1895. Ransohoff, 1897, in part.	12. 2 per cent.: Finckh, 1889.

13. *Glenoid cavity filled with capsule and fibrous tissue*, 32 per cent.: Wattman, 1820. Pfeiffer, 1886. Maas, 1886. Kocher, No. 7, 1889. Vamossy, 1890. Wolfler, 1890. Schede, No. 1, 1893. Schede, No. 2, 1892 Cotterill, No. 1, 1893. Cotterill, No. 2, 1893. McCormac, 1893, in part. Ransohoff, 1897, in part.

13. 14 per cent.: Fenger, 1889. Kocher, No. 3, 1889. Robson, 1890. Wolfler, No. 2, 1891. McCormac, 1893. Bremken, 1896. Chénieux, 1896.

14. *Glenoid cavity free*, 26 per cent.: Burckhardt, 1878. Pfeiffer, 1886. Maas, 1886. Bruns, 1887, the cartilage was intact. Garmany, 1888. Vamossy, 1890. Wolfler, 1890. Schede, No. 1, 1892. Cheyne, 1893. McCormac, 1893.

14. 2 per cent.: Lejars, No. 2, 1895.

15. *Parenchymatous hemorrhage during operation*, 3 per cent.: Pollosson, No. 5, 1893, possible injury to axillary vein.

15. 4 per cent.: Hofmokl, 1881. Veer, 1897 amputation at shoulder.

16. *Wounds of vessels during operation*, no per cent.

16. 2 per cent.: Annandale, 1875, circumflex and axillary arteries, ligation.

17. *Rupture of artery in trying to reduce before or after cutting*, no per cent.

18. *Fracture of humerus in trying to reduce before or after cutting*, 9 per cent.: Albert, 1874, surgical neck before cutting, fragments sutured.

18. 8 per cent.: Thiersch, 1874, after cutting. Kocher, Nos. 4 and 5, 1889, before cutting. Erdmann, 1896, before cutting. Veer, 1897, same.

19. *Sundries*, 13 per cent.: Vamossy, 1890, great tuberosity had to be cut off in order to unite the wound. Wolfler, 1890, head of humerus partly destroyed. Schede, No. 1, 1892, crepitation in joint. Cotterill, No. 1, 1893, deltoid adherent to humerus. Pollosson, No. 5, 1895, attempt at reduction two weeks before operation, with large ecchymosis.

19. 26 per cent.: Lister, No. 2, 1873, head removed piecemeal without interfering with the tuberosities. Annandale, 1875, removal of head piecemeal. Reid, 1880, it was a double dislocation and double resection. Ollier, 1888, difficulty keeping resected end in glenoid cavity. Fenger, 1889, coracoid process broken to make room for reduction. Fenger, 1889, head of humerus diseased. Bardeleben, 1889, suppuration of pseudo-joint. Kocher, No. 2, 1889, rupture of muscles due to recent attempt at reduction. Kocher, No. 5, there was a double fracture of the head which had been refractured in trying to reduce Kocher, No. 6, 1889, deltoid had become very stiff and tense. Kocher, No. 8, 1889, adhesions over cartilaginous surface of head. Lejars, No. 1, 1875, the head had to be removed through posterior axillary incision, because the nerves and vessels were in front of the head. Lejars, No. 2, 1895, the small pectoral muscle was sclerosed and circled the head like a bridle.

Complications After the Operation.

1. *Hemorrhage*, 3 per cent.: Burckhardt, 1873, blood soaked through the bandages.

2. *Gangrene of limb*, no per cent.

3. *Suppuration* (see results remote).

4. *Necrosis of head*, 16 per cent.: Socin, 1885. Bruns, No. 1 and No. 2, 1887, removal of necrotic pieces of head; resection of necrosed head. Wolfler, No. 1, 1890, resection of head; removal of necrotic pieces from the glenoid cavity. Pollosson, No. 4, 1893, resection of head. McCormac, 1893, resection of head through anatomical neck. Souchon, 1895, shedding of cartilages.

Complications After the Operation.

1. 6 per cent.: Israel, 1876, abundant, death. Hofmokl, 1881, bandage had to be removed every day for ten days. Bickham and Souchon, 1895, patient had to be transfused.

2. 2 per cent.: Annandale, 1875, from ligation of axillary artery.

3. See results remote.

4. 2 per cent.: Reid, 1880, necrosis of resected extremity.

5. *Formation of a pseudarthrose* at the point of fracture, 3 per cent.: Albert, 1874.

6. *Sundries*, 3 per cent: Delirium tremens and bronchitis purulent. Schonborn, No. 1, 1885.

Results Immediate.

1. *Death*, 13 per cent.: Schonborn, No. 1, 1885, bronchitis purulent. Maas, 1886, sepsis. Schonborn, No. 2, 1892, apoplexy. Pollosson, No. 5, 1893, sepsis third week. Souchon, 1895, miliary tuberculosis in peritoneum.

2. *Primary union*, 26 per cent.: Albert, 1878. Garmany, 1888. Watson, 1889. Vamossy, 1890. Gould, 1891. Cheyne, 1891. Schonborn, No. 1, 1892. Severeano, 1893. Cheyne, 1893. Ransohoff, 1897.

3. *Short suppuration*, 17 per cent.: Lister, No. 1, 1873. Burckhardt, 1878. Pfeiffer, 1886. Gurlt, 1886. Blasius 1886. Bruns, 1887. Poncet, 1893. Porter, 1894

4. *Long suppuration*, 10 per cent.: Wattman, 1820. Maas, 1886, with dissection of the tissues and sepsis. Cotterill, No. 1, 1893. McCormac, 1893. Souchon, 1895

5. *Union of fracture which occurred during reduction*, no per cent.

6. *Neuralgic pains continue*, no per cent.

7. *Sundries*, no per cent.

Result Remote or Final.

1. *Death*, 10 per cent.: Schonborn, No. 1, 1885, bronchitis purulent. Maas, 1886, sepsis. Schede, No. 2, 1892, apoplexy. Pollosson, No. 5 1893, sepsis. Souchon, 1895, tubercles in peritoneum.

2. *No improvement*, no per cent.

3. *Improved*, 5 per cent.: Wattman, 1820. Gurlt, 1886.

4. *Fair*, 16 per cent.: Schonborn, No. 2, 1885. Bruns, 1887. Wolfler, 1890. Cotterill, No. 1, 1893. Poncet, 1893. Ransohoff, 1897.

5. *Good*, 50 per cent.: Lister, No. 1 and 2, 1873. Burckhardt, 1873. Albert, 1878 Blasius, 1886. Garmany, 1888. Watson, 1889. Kocher, No. 7, 1889. Vamossy, 1890. Gould, 1891. Cheyne 1891. Cotterill, No. 2, 1893. Severeano, 1893. Pollosson, No. 1, 1893 Pollosson, Nos. 2 and 3, 1893. Cheyne, 1893. McCormac, 1893. Reboul, 1895. Tuttle, 1897.

6. *Very good*, 3 per cent.: Pollosson, No. 1, 1893.

Results Immediate.

1. 12 per cent.: Langenbeck, 1862, sepsis, death eleventh day. Annandale, 1875, third day gangrene from ligation of axillary artery. Israel, 1876, secondary hemorrhage. Kocher, No. 3, 1889, sepsis on tenth day. Lejars, No. 1, 1895. pneumonia sixth day. Veer, 1897, hemorrhage, exhaustion.

2. 30 per cent.: Reid, 1878. Hofmokl, 1881. Ollier, 1888. Finckh, 1889. Fenger, 1889. Wolfler, No. 2, 1890. Gwyer, 1891. Owen, No. 1, 1893. Delbet, 1893. Monks, 1895. Schmittle, 1895. Boone, 1896. Bremken, 1896. Chénieux, 1896. Erdmann, 1896.

3 22 per cent.: Warren, 1869. Reid, 1872. Lister, 1873. Wienlechner, 1876. Pfeiffer, 1886, Sheild, 1882. Bardeleben, 1889. Kocher, Nos. 2, 4, 5, 6 and 8, 1889. Schonborn, 1891.

4. 16 per cent.: Langenbeck, 1858. Thiersch, 1874. Reid, 1890. Kocher, Nos. 5 and 6, 1889. Hinsel, 1890. Porter, 1894. Bickham and Souchon, 1895.

5. 2 per cent.: Thiersch, 1876, on third week.

6. 2 per cent.: Marsh, 1880.

7. No per cent.

Result Remote or Final.

1. 12 per cent.: Langenbeck, 1862, sepsis. Annandale, third day gangrene from ligation of axillary artery. Israel, 1876, secondary hemorrhages. Kocher, No 3, 1889, sepsis. Lejars, No 5, pneumonia. Veer, 1897, hemorrhage.

2. 2 per cent.: Kocher, No. 4, 1889.

3. 28 per cent.: Langenbeck, 1858. Four years later Luckie observed a dislocation of the resected extremity under the acromion process. Thiersch, 1874, fracture united in third week. Weinlechner, 1876. Schonborn, 1882. Book, 1883. Billroth, 1887. Kocher, 1889. Robson, 1890. Hinsel, 1890. Owen, No. 1, 1893. Monks, 1893. Bickham and Souchon, 1895.

4. 8 per cent.: Fenger, 1889. Kocher, No. 6, 1889. McCormac, 1893. Porter, 1894.

5 42 per cent.: Warren, 1869. Reid, 1872. Lister, No. 2, 1873. Hofmokl, 1881. Pfeiffer, 1886 Sheild, 1886. Finckh, 1889. Bardeleben, 1889. Kocher, No. 2, 1889. Kocher, No. 8, 1889. Phelps (A. M.), 1890. Wolfler, No. 2, 1890. Schonborn, 1891. Gwyer, 1891. Owen, No. 2, 1893. Wyeth, 1894. Schmittle, 1895 Boone, 1896. Bremken, 1896. Chénieux, 1896. Erdmann, 1896.

6. 8 per cent.: Reid, 1880. Bellamy, 1888. Ollier, 1888. Delbet, 1893.

IRREDUCIBLE DISLOCATIONS, OLD AND SIMPLE.

9 and 10. *I. D. O.; Forward treated through an anterior incision by arthrotomy and reduction, and by arthrectomy or resection.* See cases I. to XXIX., reductions, and Cases XL. to XCI., resections.

The study of the foregoing tables shows that some twenty different difficulties and complications have been mentioned by operators in dealing with those cases: capsule thick, dissection tedious, reduction difficult, excessive fibrous tissue around the head and surgical neck, head deeply seated, head adherent to ribs, extensive muscular dissections, old fractures of the tuberosities, of the glenoid cavity, of the humerus; glenoid cavity filled with remnants of the capsule and fibrous tissue, glenoid cavity readily freed or cleared; parenchymatous hemorrhage during the operation, wounds of vessels during the operation, rupture of the axillary artery in trying to reduce before and after cutting, and various sundry difficulties.

Some of these difficulties and complications are common to both operations, or are as likely to occur in the one as in the other. They are: neo-capsule thick, dissections tedious, excessive fibrous tissue around surgical neck and head, head deeply seated, head adherent to ribs, old fractures of the tuberosities, glenoid cavity and humerus, glenoid cavity filled with remnants of capsule and fibrous tissue, parenchymatous hemorrhage during operation, wounds of vessels during operation and sundries.

We find the following more frequent in reductions; reduction difficult, excessive muscular incisions, glenoid cavity normal, glenoid cavity freed and cleared; fracture of humerus in trying to reduce before or after cutting; of the sundries we note that the greater tuberosity had to be cut away in order to be able to unite the edges of the muscular and cutaneous wounds; the head of the humerus was partially destroyed, there was crepitation in the joint.

We note as more common in the cases of resection, excessive fibrous tissue around fractures of the head or the surgical neck, hemorrhages and sundries. Although reduction difficult is

naturally more frequently mentioned in cases of reduction, 24 per cent., yet we find that in 10 per cent. of resected cases it was difficult to place the sectioned extremity of the humerus in or near the glenoid cavity. Excessive fibrous tissue is noted specially in 28 per cent. of resections against 15 per cent. of reductions. Hemorrhages have occurred oftener in resections, although there is no special reason to account for this; on the contrary, they should be more common in reductions, since these usually require more extensive dissections. Most of the sundry difficulties and complications mentioned in connection with resections are all of such nature as to have rendered resection the only operation possible.

The complications noted after the operation are: Hemorrhage, gangrene of the limb, suppuration, necrosis of head and of sectioned extremity, and the formation of a false joint in case of fracture.

Hemorrhages are more frequent in resection, 4 per cent., against none in reductions. Suppuration is twice more common after reduction. Necrosis of the head occurred in 16 per cent. of the cases of reduction against 2 per cent. of necrosis of the sectioned extremity of the humerus.

As to results immediate, primary union is noted in 26 per cent. of reductions and 30 per cent. of resections. Short suppuration occurred in 17 per cent. of reductions against 22 per cent. of resections. Long suppuration shows 10 per cent. in reduction and 16 per cent. in resection. This is all the more remarkable, that reductions necessitate more extensive dissection, and that the head and cartilage have often been reported as necrotic in reductions.

The results remote or final, show: Death 10 per cent. in reductions and 12 per cent. in resections; the causes of the fatal result are, in reductions, bronchitis, sepsis, apoplexy, and tubercles in the peritoneum. In resections, sepsis, gangrene from ligation of the axillary artery, secondary hemorrhage, and pneumonia. All these causes of death are preventable to-day except tuberculosis, apoplexy, and pneumonia, which are accidental causes. Hemorrhage can be averted by keeping close to the

bone all along in the capsulo-periosteal sheath, using a sharp chisel and hammer against the bone throughout, actually scraping the bone of its superficial compact tissue; a sharp chisel will require less force to do effective work, and is, therefore, less apt to slip and injure the vessels specially under the influence of the hammer-strokes. The dissection should proceed from backward forward. Sepsis, of course, we understand how to prevent, but it seems those cases call for extra care. The neglect to apply such systematic procedure as is recommended by Ollier to test the extent and strength of the various movements renders it difficult to judge of the true benefit of the operations, and we must be contented with the results as expressed by the operators. In a number of cases the final result is not stated. Mere improvement is not so often noted in reductions, 5 per cent., as in resections, 28 per cent. Fair results are quoted as 16 per cent. in reductions and 6 per cent in resections. Good results mark 50 per cent. in the cases of reductions against 42 per cent. in resections. Lastly, the result in good to very good is 3 per cent. of reductions and 87 per cent. of resections. If we consider only the cases noted as fair, good, and very good, we find 69 per cent. of reductions against 57 per cent. of resections, in spite of the comparatively frequent necrosis of the head in reductions. The 16 per cent. of necrosis of the head in reductions followed by resection of the head, should truly be placed to the credit of resections. Of course, the figures of percentage are most likely only approximative, because in all probability all the operated cases, good and bad, specially the latter, have not been reported.

By comparing the dates we do not see that sepsis has as yet made its full impress upon either operation. We find all the cases of necrosis of the head occurring since 1887 (Blasius), when the new era is considered to have been in operation everywhere, specially under the men of mark who stand as operators.

GENERAL AND FINAL CONCLUSIONS IN REGARD TO FORWARD DISLOCATIONS.

From the foregoing study we feel justified in formulating the following conclusions. The anterior incision is the route. Re-

duction is the more desirable operation, because it preserves the head and all the movements depending therefrom. Reduction should be done only in cases where the head and glenoid cavity are in good condition; when no extensive dissections have to be made; when it is easily effected without any great effort; when the head does not need to be trimmed, or the cup to be too deeply scooped or enlarged; when the head readily remains in place, but not too tightly. All this regardless of the time or standing of the dislocation. It should, however, always be attempted conscientiously, because many have resected, perhaps, when the dislocation could have been reduced. Disregard of these rules may result in necrosis of head, in recurrence of the dislocation or in anchylosis, with their inevitable consequences. Resections should be practised in all other cases. When in doubt it is preferable to resect. How much to resect—*i. e.*, where to saw, through the anatomical neck, or obliquely and downward outside the tuberosity, or horizontally on a level with the lower margin of the head, must be determined in each case; it is best to remove too much than too little. Of course, all efforts should be made to secure aseptic results. Extra care is called for in these cases, but specially those of reduction.

Remarks. We append here some interesting remarks on the causes of the difficulties of reductions, mostly from Delbet's paper, which was based specially on forty-four autopsies of old dislocations.

Exceptionally the fibro-cartilage of the margin of the cavity is detached, and also the periosteum, both remaining continuous with the anterior ligaments, and forming a pouch under which the head is lodged; those are called subscapulo-periosteal dislocations (Hartman and Broca). In place of the natural capsule, in some cases there is a thick fibrous mass, extending from the acromion and the deltoid to the cup and to the head of the humerus; the head has truly lost its right of domicile.[46] Sometimes the remains of the old capsule becomes partly ossified.[47] (Key. Os sesamoids dans les tendons du sus-épineux, des sous-épineux et du petit roud; Kocher, Observations II., Delbet, page 27). The capsule stretched over the glenoid may be found ad-

herent to it (cases of Bourgeois, Bordet, Burkhardt, A. Cooper, Key, Demeana, Hartman and Broca, Houel, Knapp, Kocher), one autopsy and two operations. Obs. II. and VIII; Lépine, Maas, Malgaigne (2 cases); Pfeiffer, Quenieu; in Smital (2 cases). Thore, Vamossy, Wattman.[48] In some cases the rent in the capsule has healed so completely behind the head as to prevent reduction. The capsule was ossified in a case of Kocher, No. 3. In another the glenoid cavity was filled with a thick layer of bone.[49] It is very seldom that the cartilaginous portion of the head gives insertion to fibrous bands.[50] Usually the new ligaments or adhesions or capsule extended from the margin of the new cavity to the neck of the humerus.[51] The anterior part of the neo-capsule is usually very thick, two millimetres or more, and very resistant; it is often adherent to the vessels and nerves. In one case of Lister, seven weeks old, the artery was surrounded by these fibrous bands.[52] Often a strong fibrous band, well described by Malgaigne, extends from the inferior surface of the acromion to the head of the humerus near the greater tuberosity. This is well mentioned in the cases of Bardenheuer, Faure, Fauratier, Houel (Dupuytren's Museum, 731A.), Malgaigne.[53]

The tendon of the biceps may remain in the groove and follow the humerus. It is more or less blended with the neo-capsule, and it is often difficult to dissect it. Sometimes it is adherent to the groove (Parmenter), in some cases the tendon is disinserted from the groove, glides behind the head, where it forms a tense cord in front of the glenoid cavity, (Kocher, 2 cases, observations V. and VI.; Gauderon, Knapp, Lepine, G. Smith, 2 cases, Schede).[54] In operating take care of the long tendon of the biceps. It is said that it is never displaced from its sheath in ordinary subcoracoid dislocations of the limb (F. B. Lund).[55] The tendon of the biceps should be preserved or stitched back (author).

The muscles or their sheaths, or both, often undergo sclerosis, and this prevents reduction of the head, as proved by unsuccessful reduction only after the section of the muscles (Dieffenbach, Weinhold, Bardenheuer, Ollier, Kocher, Bordet, Cooper,

Parmenter). The deltoid and the supraspinous are the muscles which mostly oppose the reduction.[56]

In some cases the anterior edge of the glenoid cavity forms a part of the new cavity, and this condition renders reduction illusionary and probably useless. This is met with once in every five.[57] Sometimes the old glenoid cavity becomes filled up by fibrous tissues.[58] The inner edge of the new cavity found on the scapula presents usually a high, rough edge.[59]

The head proper of the humerus may remain normal, but it is usually flattened behind, where it is articular. Its front part becomes covered with more or less irregular projections or stalactites.[60] With all this it may also be very large, rendering reduction impossible. The small tuberosity is sometimes torn away by the subscapular.[61] The greater tuberosity, when torn away and loose from the muscle, drops into the old glenoid cavity. When it still remains attached to the muscle it becomes united, but in an irregular manner, causing deformity and considerable widening of the region.[62] In some cases the tuberosities are very much enlarged, without any trace of fracture.[63] All those anatomo-pathological changes occur sometimes rapidly. The adhesion of the capsule to the cup has been found after two or three months; the head flattened after one month, even twenty-three days; the muscular retraction after five weeks.[64]

Usually several of the causes combine to prevent reduction or resection; it is very seldom that a single cause accounts for it.[65] What influences the results most is the degree of the lesions, the condition of the muscles, the manner in which the operation is performed in regard to asepsis, the individual predisposition; some patients manufacture fibrous tissue so rapidly that it is very difficult to prevent anchylosis, such as rheumatic patients.[66]

The axillary route was advised by Langenbeck, because of the projection of the head into the axilla.[67] It allows an easy resection. But it does not permit reduction if it were possible; it does not enable to clean out the cup; the vessels and nerves are more exposed to being wounded, especially the circumflex; the upper parts of the new and of the old capsules are immova-

ble, and cannot be destroyed, and as they prevent the head from bulging, it renders the resection more difficult.[68]

The posterior route was recommended by Charles Nélaton, but it does not allow of any access to the anterior part of the head and of the adhesions of that part.[69]

The anterior external route is the one which has scored the greatest number of successes.[70] The incision of Langenbeck (acromio-humeral) is a more vertical one than the next one; it gives an easy access to the cavity, but it renders the head less accessible.[71] The interpectoro-deltoid incision is rather farther from the cavity, but it gives better access to the head.[72]

The normal or good condition of the muscles of the shoulder is a circumstance which has been so far too little considered in regard to the probable result of a severe operation (arthrotomy or resection[73]).

A most important point is to get primary union. Suppuration is more frequent in arthrotomy.[74]

The functional result depends specially upon the after management. At first place the arm in the position which keeps best the head into the cup. Next follow the instructions laid down by Ollier in his treatise on *Resection*.[75]

11. *I. D. O. and forward, treated through an axillary incision by arthrotomy and reduction*, is represented by one case only, that of Kocher No. 1, 1889. (See Case II.) The greater tubercle, which was broken off, had to be resected in order to be able to reduce; the capsule was very much thickened. There was suppuration, followed by resection of the head. Seven months after the joint was almost anchylosed.

12. There are eight cases on record of *I. D. O. and forward, treated through an axillary incision by resection*, by Langenbeck, 1860, Lister, 1873, Spieker, 1876, two cases; Langenbeck again in 1877, two cases; Volkman, 1882, and Nélaton, 1888 (see Cases XCIII. to C.)

In Langenbeck's of 1860, the great tuberosity had been fractured; Lister had ruptured the artery in trying to reduce before cutting; Spieker also found the tubercle had been broken off in

his two cases. Nélaton mentions the same complication. In case No. 2, of 1877, Langenbeck found the operation laborious, because the head was more deeply seated than appeared; there was also considerable hemorrhage, requiring the ligation of many vessels, probably the subscapular, in the depth of the wound. Volkman speaks also of great difficulty; the lesser tuberosity was broken, there was hemorrhage due to the injury of the axillary vein by a splinter of bone; the vein was ligated. Nélaton says that the posterior portion of the articular capsule was flattened against the glenoid cavity, was thickened, and did not permit itself to be sufficiently separated to allow the head to be reduced; to overcome this obstacle it would have been necessary to split the capsule crosswise, but the incision having been made in the axilla, the capsule could only be reached with the tip of the finger from deep in the wound, and it would have been difficult to introduce a bistoury; so resection was done. Following the operation, Lister mentioned great shock; there was suppuration in Spieker's two cases; erysipelas in Langenbeck's case No. 2, of 1877; Volkman's, healed primarily; Spieker's No. 1 showed short suppuration; Spieker's case No. 2, long suppuration. Death followed in the case of Lister in three hours, of Spieker's No. 2, from sepsis, and of Langenbeck's No. 2, 1877, from erysipelas and sepsis. The results final are, therefore, three deaths (Lister's, Spieker's No. 2, and Langenbeck's No. 2, 1877); little improved, Langenbeck, 1860, and Langenbeck's No. 1, 1877; improved simply in Spieker's No. 1. This route is, therefore, fraught with danger, and should not be followed in cases of forward dislocations.

13. We found two cases on record of *I. D. O. and forward, treated through a posterior incision by arthrotomy and reduction*, by Schonborn No. 3, 1885, and Mudd, 1895 (see Cases CI. and CII.) Repeated attempts were necessary in the case of Schonborn; the acromion process, which had been detached according to Kocher's method, was with difficulty pressed back into position in Mudd's case. Recurrence of dislocation upon dressing the case took place in Schonborn's. The healing of the wound was even in Schonborn's; primary union took place in Mudd's case.

The results remote were good in Mudd's and not mentioned in Schonborn's.

14. Of *I. O. D., simple and forward, treated by subcutaneous sections of fibrous bands* (tenotomy, myotomy), five cases stand on record: Weinhold-Swanzig, 1819, Dieffenbach, 1839, Simon, 1852, Polaillon, 1882, Mollière, 1886 (see Cases CII. to CVII).

Weinhold picked up a fold of skin; the external portion was incised transversely the extent of a half a finger's breadth from the insertion of the great pectoral, very forcible extension being kept up; while this was accomplished the wound was increased in length to the extent of nearly half a finger's breadth; immediately the humerus approached near the glenoid cavity, and returned in place. The operation was simple in the case of Dieffenbach, it was done in one sitting, when traction reduced the head; Simon did it in three sittings; Polaillon attempted reduction only three days after the tenotomy. There were no difficulties and complications during the operations nor after. There was no suppuration, no trouble of any sort. The results remote are stated as being very good in all five cases. It is astonishing that a method so simple, so safe, and giving such perfect results, should not have been tried oftener. However, when we consider the great difficulties encountered in an open operation before the head can be reduced, when it can be, after the necessary sections have been freely done, it is really most probable that the method has been tried, but has been found wanting, and the failures have not been recorded. It seems best adapted to selected loose cases.

15. Of *I. D. O. forward, treated by osteotomy of the neck*, we could only find one case on record, by Dr. Mears (see Case CVIII.) It was a subcutaneous osteotomy as practised by Mr. Adams. The operation presented no difficulty nor complication, nor were there any complications after the operation. The wound healed without suppuration; the result remote was good for awhile, but later a callus formed, and result final proved to be very unsatisfactory. This ought not to encourage in such an operation.

It is sometimes difficult to decide from the description of the

case if it is a downward (subglenoid, axillary) or a forward dislocation (subcoracoid, preglenoid) that is meant.

16. *I. D. O. and downward, treated through an axillary incision by resection*, are represented by three cases; Langenbeck, 1877, Patterson, 1879, Thomas, 1885 (see Cases CIX., CX., CXI.). There was no special difficulty or complication except that in the case of Thomas the operation was long and tedious, and great difficulty in freeing the head; it had to be removed by slices. In this case of Thomas there was suppuration after the operation. There was primary union in all the cases except Thomas', in which the wound closed at the end of the second month. In this same case there was little improvement; in the two others the final result is not recorded. The operation should be performed, but may prove not so very easy.

17. We found only one case of *I. D. O. and downward, treated by osteoclasia.* It is the case of Desprès (see Case CXII.) It consisted in the deliberate fracture of the neck, so as to be able to bring the arm close to the body; the forced elevation of the arm causing it to press against the acromio coracoid vault or arch, determined the fracture; a cracking sound was heard and crepitation felt. There was no difficulty, no complication, during the operation. There was formation of a callus, it was impossible to obtain a false joint, and the operation resulted in a thorough failure. This procedure should be rejected, except, perhaps, in special cases when a more serious operation is out of the question. It is to be remembered that several cases of fracture in trying to reduce have been followed by fair results.

The writer proposes the following operation in place of subcutaneous osteotomy or osteclasia, in cases where there are no serious pressure symptoms, and the patient is not in a condition from age, debility, etc., to stand a long operation with possible injury to the vessels, and their consequences. After exposing the bone, resect at least one inch of the shaft of the bone where it joins the head, place the resected extremity in or near the glenoid cavity, etc.; begin passive motions early. This procedure leaves the head in an abnormal position, and that is the great objection to it; but it is a simpler operation than the

regular one for reductions or resections in the class of cases above referred to, where the head is firmly bound down.

We have no cases of *I. D. O. and backward treated by reduction in the adult.*

18. There are three cases of *I. D. O. and backward, treated by resection in the adult,* reported by Reid, 1877, Adams, 1888, and Brinton, 1897 (see Cases CXIII., CXIV., CXV.). The cases of Post, 1881, and of A. M. Phelps, 1895, are congenital, and will be considered under that head.

Reid's case was fifty-three years old. The age of Adams's case is not mentioned. No difficulties were mentioned. No complications after the operation are noted. The results immediate are not described. The results remote are: not improved, Reid's case; fair in Adams's. Although these results are not brilliant, they suffice to justify the operation. Brinton's case was complicated with a united fracture below the tuberosities; the final result was satisfactory.

19. *I. D. O. simple, with a limb useful in its new position, to all intents and purposes to the patient,* should not be operated.

20. *I. D. O. and congenital, operated by reduction,* are three in number, operated by Kuster, 1882, No. 3, 1892, and Brown, 1897 (see Cases CXVI., CXVII., CXVIII.). Kuster's case was fourteen months old at the time of the operation, Schede's case was eight years, but the luxation was congenital and intrapartum, as was proved by the doctor who attended the mother's confinement. Brown's child was several months old when operated. In the case of Kuster the head was freed, brought forward and rotated. In Schede's case the head was freed, the glenoid cavity enlarged and deepened, and the anterior part of the capsule removed; the posterior part is freed from the glenoid cavity, and drawn forward so as to cover the head; dislocation reduced; the coracoid process had become larger and longer and bridged over the inner portion of the normal cavity in such way as to prevent reduction; it was separated partially at its base by an osteotomy, and broken so far backward that it no longer prevented reduction. The reduction was easy in Brown's case. There was fever and suppuration in Kuster's case. In Schede's case

suppuration also, and later the greater tuberosity was found to be necrotic and was removed, and the healing was gradual. Brown's case healed kindly. Death resulted in Kuster's case one month after operation. In Schede's case the result was good. Brown's case was much improved.

Remarks. In Kuster's case there was also a similar dislocation on the other side, but it was not operated. In résumé, the operation should be done, as there is no other alternative, but observing the rules governing reductions as set forth.

21. There are three cases on record of *I. D. O. and congenital treated by resection*, one by Post in 1861, and two cases by Phelps (A. M.), 1895 (see Cases CXIX., CXX., CXXI.). (Phelps mentions one case operated by Gerster and four other operated cases, but he gives no references.) All these cases are backward dislocations, subspinous. The operation performed in Post's case was a longitudinal incision made over the posterior edge of the deltoid, dividing the fibres of that muscle, and exposing the head of the humerus, which was found to be dislocated on the back of the scapula. The scapula was denuded and the extremity of the bone turned out; a leaden spatula was pushed beneath the bone to protect the soft parts, and exsection with a saw made of the upper extremity to the extent of three-quarters of an inch. On examining the limb and moving it in different directions it was thought best to remove an additional portion of the bone, the second portion removed being nearly as long as the first; the hand was then brought forward across the anterior portion of the chest, where it lay in a very easy position without apparent difficulty; the edges of the wound were brought together by means of eight twisted sutures made with insect pins. In Phelps's case No. 1 a curved incision was made along the lower edge of the deltoid in the scapula, and the flap turned down; it would, said he, have been better to curve the incision downward and turn the flap upward, as it would give better drainage; the posterior edge of the glenoid cavity was gone; the cavity was about two-thirds the usual size. It was considered whether to enlarge the cavity or trim the head of the bone; it was decided to do the latter, because,

had the cavity been enlarged, it would have been necessary to shorten the humerus in order to replace it, and the result remote might have been, in bringing the two raw surfaces together, anchylosis of the joint. (*Medical Record*, September 21, 1895). A portion of the head of the humerus was cut away in order to fit it into the socket; also cut away a portion of the redundant capsule, posteriorly; the bone was replaced, and a stitch put in behind to help retain the head in place. There was no complication following the operation except in Phelps's second case, which suppurated. The result immediate is not mentioned in Post's case; in Phelps's No. 1 it was very good, and in case No. 2 only fair. The operation is thoroughly indicated. Dr. Phelps says the method promised success the first year, although one case has been operated in which it was successful in the fifth year; he gives no references.

22. *Irreducible dislocation in young subjects*, that is in children and in subjects under seventeen and eighteen years of age, should be treated by reduction, if possible, or by resection of the cartilaginous portion only of the head. It is most important not to injure the epiphyseal cartilage. The ossified portion of the head may be removed, but the epiphyseal cartilage between the head and the shaft must be spared if there is any possibility. A horizontal section with the saw, starting at the internal insertion of the capsule around the head, will surely carry away the totality of the conjugating cartilage.[76] In young children, if the resection is made below the epiphyseal cartilage, the arm will cease to grow. The resected extremity should not be pushed into the glenoid cavity in children, lest the growth of bone cause anchylosis.[77a]

23. *Irreducible dislocations old, in old or debilitated subjects*, should not be operated, except under very favorable local and general conditions, or under serious indications. Resection of one inch of shaft near the head is best adapted to these cases.

24. *I. D. O. and double, i. e., in both sides simultaneously*, and operated, have been reported three times; Lister (2 cases), 1889–90. Reid, 1880.

Lister's first case was operated by reduction on both sides at an interval (see Case III.). The second case was operated by

resection on the right side and reduction on the left side (see Case III.). Reid's case was a double subclavicular, and the two sides were operated by resection at an interval of two and a half months (see Case LI.). These cases have already been considered as regards operation, difficulties, etc. There are two or three more double dislocations reported, but one side only was operated.

25. No case of *I. D. O. spontaneous and pathological, i. e.*, similar to such cases as the coxofemoral articulations, has been found on record.

26. *I. D. O. and paralytic*, are irreducible simply because they cannot be kept reduced, although they are readily replaced in the socket, because the muscles have lost their power through paralysis of their nervous supply from peripheral or central causes. The peculiar joint diseases described by Charcot, specially in connection with locomotor ataxia, are cases also in point. The treatment should be directed to the cause.

In *I. D. O. from paralysis of the deltoid:* expose articular surfaces, pare them, and let them become anchylosed.[77b] The following is a case in point:

1886. Wolff (J.) I. D. O. downward (paralytic), posterior incision, reduction, stitching of head to glenoid cavity, result, improved.

Male, aged 5 years. *Diagnosis:* This was a perpendicular luxation downward of the shoulder, due to severe accident and a traumatic myopathy. The head of the humerus had sunk about three centimetres from the acromion and glenoid cavity, so that one could easily push one's finger into the space between the head and the acromion. *Duration:* Three years. *Movements*, etc.: The right scapula is slightly dislocated on keeping the arm quiet. The lower angle of the scapula stands off from the thorax and the angle, and the lower part of the inner border is nearer the spinal column on the right than on the left side. The arm hangs close to the thorax, and moves like a pendulum when the patient, by changing the position of his body, starts its movement, or when one pushes the arm in any position it will swing back and forth without the will of the patient. The humerus is thereby rotated inwardly, so that the greater tuberosity points inward and the lesser tuberosity backward.

The sulcus (intertubercularis), or sulcus between the tuberosities, is easily palpable, and appears as deep as in the dry bone specimen. Acromion, processus coracoideus, and the upper rounded, depressed, and lowered head are prominent, and are easily distinguishable. Patient raises the scapula and abducts the angulus scapulæ. The arm does not follow the movements of the scapula. When the patient makes a great effort, then he can for a moment raise the caput humeri and scapula, so that it may be at its normal height. More certain, and then only for a moment, the caput humeri will reach its normal height by reflex when one gives the patient a sudden blow on the back. Should the patient desire to elevate the arm, then he moves the arm with the body, outward, with a swinging motion, pendulum-like, and then catches the right hand with the left and raises it. Atrophy of the deltoid is so marked that when one attempts to grasp it with one's fingers, almost nothing can be seized. The supraspinatus and pectoralis major muscles were less atrophied, as well as the muscles of the forearm. However, the muscle pectoralis major is weak, and only acts on fixing the head of the humerus, whereas the muscle latissismus dorsi is under the same circumstances stronger. Every other action of the shoulder-joint is impossible. One can passively move the humerus in any position of luxation or subluxation. The shortening of the injured upper arm in comparison with that of the healthy was two centimetres, of the forearm and hand, one centimetre. Movements of elevation were only possible when the child, by movements of the body, gave motion to the arm like a pendulum. The upper arm is greatly atrophied, and that very evenly on the anterior and posterior surfaces. The elbow-joint, due to the flaccid hanging arm, could not be moved. When the upper arm is elevated and fixed the patient is able to actively straighten the elbow, when it has been previously bent, or if the patient has allowed it to fall by its own weight into a flexed position. If one fixes the upper arm, then rotates it firmly inward, and elevates it to an angle of 45°, then there is a possibility of weak active movements in the forearm. Pronation and supination of the forearm are but slight, and only possible when the forearm is bent. The closing and stretching open of the hand with finger movements can be easily done. On the pectoralis major one notices fibrillar movement, particularly when one breathes or blows on that region. Sensation to pain, temperature, and position, is equal on both sides. No vasomotor disturbances exist.

Eulenburg's electric examination shows a marked decrease of nervous

(irritation) excitement (faradic) in the nerves of the axilla, and less in the plexus over the clavicle; no decrease in the other nerves of the arm. Marked decrease of faradic muscular irritation in the deltoid; has decreased in biceps, triceps, and supinator longus, and no reduction of muscular irritability in the forearm muscles; marked decrease of galvanic muscular irritability in the deltoid; no arterial reaction.

Operation. The arm was abducted so that the posterior border of the glenoid cavity could be easily palpated, and an incision was then made six centimetres long, beginning at the posterior angle of the acromion, along the posterior border of the glenoid cavity downward. This incision laid the joint open. The humerus was then rotated inwardly more than was natural, and so much of the muscular insertions at the greater tuberosity as were necessary to permit of this abnormal rotation were cut away. This permitted a good apposition of the head of the humerus with the glenoid cavity, and after obtaining this marks were made on the head of the humerus and overlying glenoid cavity, as it was intended to knit the humerus to the glenoid cavity by means of ivory pins. The author then chiselled off a thin layer of cartilage on the head and cavity, and drilled a hole through the head of the humerus from inner side to the outer and on the border of the middle and outer third.

In boring of the scapula it was sought to have the hole one centimetre from posterior border, for fear the bone would break off if the drilling were too near the border. In order to do this it was necessary to make a horizontal incision from the middle of the vertical incision through the fibres of the infraspinatus. After boring the holes it was found that the ivory point could not be forced through both holes, as they were not on a straight line, therefore, a strong silver wire was passed through both holes, and then twisted until the chiselled surfaces of the bone were in close apposition. The fixation was so complete that it was not necessary to make another knitting. The author then extirpated a portion of the articular capsule, and left as much as would be necessary for the joint, and then closed the capsule with catgut stitches. Both muscle incisions were then closed with buried catgut sutures, and the skin wound closed with the exception of a small point for drainage.

Difficulties and complications of the operation: ? *Complication after the operation:* ? *Result immediate:* primary reunion; *Result remote;* result better than could have been hoped for. Patient can now, by means of scapula, lift and depress arm, which formerly dangled lifeless.

Against all expectation it has happened that a form of new joint has developed, but with very limited motion, which does, however, permit rotation inward and outward, and even makes it possible upward and downward; no firm union having taken place between head of humerus and glenoid cavity. Head of the humerus fixed to scapula, so that now the patient can slightly raise the arm, also slightly abduct and adduct the same. The author had hoped to obtain an osseous fixation of the denuded head and cavity. This did not result that way. It is, therefore, fixed by silver wire and by the fibrous tissue attached to the openings of the bored holes to the cicatrix, and we have, therefore, a new jointing with limited motion. There is slight rotation. Patient can throw a ball up or to the ground; can walk with a cane in the right hand; also can strike with a stick; can brush his shoes with the right hand, and can also write with it. All these movements could not be made before the operation. No marked progress in movements at the elbow. After operation marked contractions were induced in the deltoid muscle, which previous to it did not react at all. This was the condition four months after the operation.

27. *I. D. O. complicated with persistent atrophy of the muscles, or with muscles not responding to electrical test,* should not be operated, for obvious reasons, unless to relieve troublesome pressure symptoms.

28. The same applies to *I. D. O. complicated with fatty or sclerotic degeneration of the muscles.* It is recognized by the fact that when under an anæsthetic, while the muscles of the opposite shoulder are completely relaxed, yet those of the affected side are still rigid and tense. It calls for section of the unyielding muscles. This sclerotic and fatty condition is not rare in cases of anchylosis of old irreducible dislocations of the shoulder specially, and is often one of the most potent factors in preventing the reduction of the bone even after the head has been exsected.

29. The same applies also to *I. D. O. in subjects rheumatic or gouty,* because they are apt to be followed by anchylosis, especially if reduction has been done; these subjects manufacture fibrous tissue too readily.

30. *I. D. O. complicated with diseases at large* should be treated with the greatest care. Tripier's case is one in point.

31. *I. D. O. complicated from having been subjected to great efforts at reduction* should not be operated for some two or three weeks, lest we find bruised tissues, extravasated blood, etc., which may be the causes of suppuration and sepsis. Langenbeck, 1877, is one example (Case XCVII.); also Kocher, No. 3 and No. 6, 1889 (Cases LXV. and LXVIII.).

32. *I. D. O. complicated by arthritis acute should not be* operated until the acute state is over.

33. *I. D. O. complicated with chronic arthritis or with suppuration* are reported by Reid, 1878 (Case L.); Bardeleben, 1889, (Case LXIII.); Fenger, 1889 (Case LXII.); Schede, No. 2, 1892 (Case XXIII.); Bellamy, 1887 (Case LIX.). They should be operated as soon as possible.

34. *I. D. O. complicated with anchylosis of the head in the pseudo-cavity* is mentioned by Post, 1861 (Case CXIX.); Hofmokl, 1881 (Case LIII.). They usually present great difficulties, specially if the anchylosis be fibrous and close, but particularly if it be osseous.

35. *I. D. O. complicated with pressure symptoms of the vessels and nerves* should be operated, if only for the relief to be obtained, provided no serious contraindications exist.

36 and 37. In *I. D. O. complicated with fractures during attempt at reduction soon, before, or during the operation,* if the fracture is very *high up*, it is safest treated by resection of the broken head; when the *fracture is in the middle*, the head should be resected below the ball and the balance of the fragment brought in opposition with the lower fragment. Thiersch's case, 1874, is an example (Case XLV.). We will recall here the following cases of *O. D. and new fractures* of Kocher's, 1889–90. In case No. 2 (Case LXIV.), one week before operating an attempt to reduce was made and the bone fractured through the anatomical neck; the greater tuberosity was torn off, also the subscapular, the short head of the biceps; the fractured head was resected or removed, and the result was good. In case No. 4 (Case LXVI.), attempt at reduction before operating was followed by fracture of the head of the humerus, the fracture line passing also through the greater tuberosity; resection of

the head, result good. In case No. 5 (Case LXVII.) there was an old united fracture of the head through anatomical neck, and of the tuberosity; the bones were refractured in the manipulations to try to reduce before operating; the fractured bones were removed, with an improvement of the case. The same accident—*i. e.*, refracture—happened to Erdmann, 1896 (Case XC.), and to Vander Veer, 1897 (Case XCI.).

38. *I. D. O. complicated with injury to the vessels before operating*, and followed by an operation, is represented by the classical case of Lister, 1873 (Case XCIV.), a rupture of the axillary artery.

39. *I. D. O. complicated by injury to the vessels during operation* has been recorded in the case of Annandale, 1875 (Case XLVII.), (circumflex and axillary arteries); Langenbeck, No. 2, 1879 (subscapular artery), (Case LXVIII.); Hofmokl, 1881; Volkman, 1882 (sulclavian vein), (Case XCIX.); Vander Veer, vein and artery, axillary (Case XCI.). The injury to the vein rendering ligation necessary, and followed by threatening gangrene, calls for the deep consideration of the advisability of ligating the axillary or brachial artery below the largest collateral. Injury to both artery and vein or uncontrollable hemorrhage must be met as done by Vander Veer, by amputation of shoulder.

40. *I. D. O. complicated with old fractures, non-united, of the tuberosities*, call for the resection of those pieces, which are usually connected by more or less numerous short, dense, fibrous bands.

I. D. O. complicated with old united fractures of the tuberosities, of the anatomical neck, and of the surgical neck are common—36 per cent. of all forward dislocations. They are usually surrounded by such a great amount of fibrous tissue or by such callous as to render the operation more difficult. The partial resection of the tuberosities is sometimes required to obtain room to work, as in the Bickham and Souchon case.

41. *I. D. O. complicated with old united fracture of the shaft* are not likely to give trouble, being low down.

42. *I. D. O. complicated by a previous unsuccessful operation*

give great trouble, as proved by the case of Bickham and Souchon (Case LXXXV.), where the adhesions between the surgical neck and the surrounding parts were great and resistant; also between the cartilaginous surface of the head with the surrounding tissues. The head was much hypertrophied; it had to be partially resected with the gouge and hammer to make room to continue the operation; it was also very hard, almost eburnated—all this due to the long suppuration that followed the first attempt.

I. D. O., recurrent or habitual, are irreducible in that they cannot be kept reduced.

43. *I. D. O. recurrent, treated by stitching of capsule* (reefing), are reported by Ricard, 1892. Two cases (see Cases CXXII. and CXXIII.). An anterior incision in the pectoro-deltoid interstice; at the upper end the incision is prolonged at right angle, following contour of the insertion of the deltoid to the clavicle and acromion; the muscle is detached and turned outward and backward; the coraco-brachial is then lifted by an assistant; the operator frees the upper or inferior edge of the subscapular muscle at its humeral insertion; the arm is then rotated inward firmly, so that the anterior wall of the capsule is relieved of tension; then through the top of this wall, through the capsule, and into the thickness of the subscapular muscle the operator passes three stitches of a coarse flat silk, vertically directed, and about two centimetres one from the other. The free extremities of these threads are tied, two by two, in order to reduce this anterior wall to the least but most resistant and rigid thickness. There were no difficulties or complications during the operation nor after; the results immediate were not mentioned. The patient is reported as keeping well during the nine months following the operation, when he was employed wheeling a wheelbarrow. This surely is the ideal operation for habitual dislocations.

44. *I. D. O. recurrent, treated by incision of capsule, overlapping, and stitching*, is the first case of operation reported for recurrent dislocation by Samosch in 1889. (See Case CXXIV.) Through an anterior incision the capsule was reached and split longi-

tudinally; the medial portion was drawn over the lateral and pulled strongly and stitched in this position. No difficulties nor complications are mentioned; the healing was primary and the final result very good.

45. We found three cases of *I. D. O. recurrent treated by resection of portion of the capsule and stitching:* One by Gerster, 1884, and two by Burrell, in 1897. (See Cases CXXV., CXXVI., and CXXVII.)

Gerster's is a case where reduction was effected without any difficulty, the arm put up in a plaster bandage for five weeks. Upon the removal of the bandage the dislocation reappeared, and the mere weight of the extremity alone was sufficient to cause the reappearance of the dislocation. An anterior incision was made and the capsule exposed; its inner aspect, the side facing the axilla, was abnormally relaxed; a piece one inch long and two in width was excised from it, while the arm was firmly rotated outward. A counter-incision was made into the posterior part of the capsule for drainage; closing of the anterior incision. There was no difficulty nor complication during the operation. Septic fever set in a few hours after, due to the catgut drain; it was removed and replaced by a drainage-tube; wound treated openly. There was long suppuration, with erysipelas. After the healing, the functions of the joint were fair and promised to improve.

Burrell proceeds also through an anterior incision; the operations were more elaborate and systematic, presented no difficulties nor complications, healed primarily and gave very good results.

The cut which accompanies his description shows the field of operation; it is a drawing from a dissection made to demonstrate this operation, by Dr. F. B. Lund. The important detail which is shown in the cut is the divided tendon of insertion of the pectoralis major. This allows the retraction inward of this muscle, uncovering the capsule of the joint. In order to gain access to the joint the subscapularis muscle should be partially divided. Then, with hooked retractors, a piece of the capsule can be excised.

The following description gives in detail the operation:[79]

The patient was etherized and the arm slightly abducted. An incision was made from the coracoid process downward and outward, following the line of the cephalic vein to below the upper border of the tendon of the insertion of the pectoralis major. The cephalic vein was then recognized, drawn outward, and the intermuscular septum between the deltoid and the pectoralis major was separated with the handle of the scalpel and with a few touches of the blade. This exposed in the upper part of the wound the coraco-brachialis and short head of the biceps, and in the lower angle of the wound the upper part of the insertion of the pectoralis major.[80]

The acromio-thoracic artery was distinguished; the upper three-quarters of the insertion of the pectoralis major was divided, in order to allow the muscle to be retracted inward and thoroughly expose the head and neck of the bone. These now came into view, and in front of the head and neck of the bone could be seen and felt, through its sheath, the long head of the biceps. It was found necessary to clear the tendon of the coraco-brachialis, short head of the biceps quite up to the coracoid process, and to carry the incision in its whole depth up to the coracoid process.[81] By externally rotating the arm and dropping it backward the insertion of the subscapularis muscle could be distinguished, and its tendon was stretched over the head of bone. A portion of this insertion was divided. The finger felt the head of the bone, the anterior two-thirds of which was very plainly exposed, and it tended to slip forward toward the coracoid process. The coracoid process could be plainly distinguished, and the capsular ligament was apparently lengthened.[82] The arm was then abducted to an angle of 45°, and the head of the bone pressed backward to prevent the head from coming up under the coracoid process. By these means the front of the capsule was grasped with a three-pronged vulsellum forceps. Three sutures were inserted with a curved needle beneath this, and this fold of the capsule was excised three-quarters of an inch in length and five-eighths of an inch in width.[83] Two of the sutures were cut out at the time of re-

moving the bit of the capsule. The other suture held and was tied. Another suture was introduced into the capsule. After these sutures were tightened and tied it was found that the capsule was distinctly tighter and shorter.

The acromio-thoracic artery was divided, and was the only vessel requiring ligature. Sterile water was used for irrigation. Silkworm-gut sutures closed the whole length of the wound. No attempt was made to unite the partially divided insertions of the pectoralis major and of the subscapularis, as when the arm was brought to the side these structures came together without suturing. The wound was dried; an antiseptic dressing was applied, and the arm fixed to the side with the hand across the chest.[85]

A clear differentiation must be made of all the anatomical structures, and with this accomplished, the operation is feasible. The use of broad retractors without sharp points, on the inner side of the wound, to retract the coraco-brachialis and the vessels, is of great importance.[86] The important steps in the operation are: The free division of the tendinous insertion of the pectoralis major for three-quarters of its breadth, in order that the head of the bone and capsular ligament may be freely exposed by retracting the muscle; the division of a portion of the subscapularis; raising the arm to a horizontal plane and pressing back the head of the bone, which relaxes the front of the capsule so that it can be grasped and a bit removed.[87]

The result of the operation in the first case (Case V.) is that a year and ten months after the operation, the patient, when seen, stated that there had been no recurrence of the dislocation; that he had been fishing on the Grand Banks during the summer of 1896, and that the motions of the joint were perfect.

In the second case, at the end of two months the patient is using the arm freely, and has had no recurrence of the dislocation.[88]

The first operation took one and three-quarter hours. The second took thirty-five minutes. It is purely an anatomical operation, and each anatomical structure must be recognized as carefully as in the ligation of an artery. So far as one can

generalize from these two operations, it is simple, efficient, and curative.[89] This operation is a more severe one than mere stitching, and should be reserved for when the stitching fails.

46. There is one case reported by Albert, 1888, of *I. D. O. and recurrent treated by reduction* (see Case CXXVIII.). The joint was penetrated through a posterior sinus; the head and glenoid cavity were deprived of their cartilages and stitched together. No complications followed the operation, but it resulted finally into anchylosis of the joint.

47. The cases of *I. D. O. recurrent treated by resection of the head*, was reported by Cramer, 1882, Porter, 1882, Sacré, 1883, and Owen No. 2, 1893, Monks, 1896 (see Cases CXXIX. to CXXXIII.). They were all subcoracoid dislocations. The operation consisted in an anterior incision; Langenbeck acromio-humeral was used by Cramer. There were no difficulties, no complications during the operation, nor any complications after. They all healed by first intention, except Porter's case. The results remote were: Fair in the case of Cramer and Owen, good in Sacré's, and improved in Monk's. This operation strikes one as a rather severe one when contrasted with the result of Ricard. It is true in the latter's case there was no rent of the capsule; but when this exists it should be pared and stitched. Excision of the head of the humerus is a mutilating operation, and will be very rarely necessary. It is conceivable that after an exploration of the joint, abnormalities might be found which would demand an excision.[90]

48. *I. D. O. operated by resection and reduction and followed by long suppuration* has been met with in 32 per cent. of all forward dislocations. This is, indeed, too much, and calls for the greatest care in asepsis and antisepsis in the future. The head had also to be resected after reduction in the case of Kocher, No. 3, 1889, a case of forward dislocation operated through an axillary incision (Case XCII.), also Socin's case, 1885, reduction, necrotic pieces, then resection (Case VII.); also in Schede's case No. 3, 1892, backward dislocation, congenital, reduction, necrosis of greater tuberosity (Case CXVII.). The same remarks apply here with much greater force. It shows also how considerate the surgeon should be before reducing instead of resecting.

49. *I. D. O. operated by resection or reduction*, and followed by necrosis of the bones, is recorded in 2 per cent. of the resected cases, as against 16 per cent. of the cases reduced of forward dislocation.

50. *I. D. O. operated by reduction and followed by anchylosis of the head in the old glenoid cavity* is one of the dangers inherent to reductions. It has been observed, specially when the surfaces were tightly bound down and when the after-treatment had not been most carefully attended to from the beginning.

51. *I. D. O. operated successfully by reduction, and followed by recurrence and anchylosis in the pseudo-cavity*, is mentioned by Albert, 1888, a recurrent case.

52. *I. D. O. operated by resection and followed by anchylosis of the sectioned extremity of the humerus in or near the glenoid cavity* have been observed, specially in the case of Kocher No. 4, 1889 (Case LXVI.), and of Bickham and Souchon, 1895 (Case LXXXV.). Cases requiring the resection of the superficial head are apt to be followed by anchylosis. For this reason it is best in adults to resect more extensively than is actually necessary to produce movement, but in young subjects, especially in children, as said before, the great importance of not injuring the epiphyseal cartilage will render the opposite course the rule to be guided by. This anchylosis of the sectioned extremity may require either section of the muscles or resection of the anchylosed extremity. The latter is often a laborious undertaking on account of the extensive and resistant adhesions, due to the fact that the parts have already been operated upon before. The muscles are also retracted and degenerated in these cases. This condition is often due to improper consecutive or after-treatment, either because it was not begun soon enough or was not kept up long enough.

53. Sometimes *I. D. O. operated by resection is followed by dislocation of the sectioned extremity of the humerus under the acromion or under the clavicle under or inside of the coracoid process*, forming an acromio-humeral or a coraco-humeral or a cleido-humeral articulation instead of a glenoido-humeral. Ollier mentions a case where he had a great deal of trouble to prevent

it. It was observed in a case of Weinlechner, 1876 (Case XLIX.). It is usually the result of improper attention to after-treatment at the proper time. In one case reported by Luckie the resected extremity articulated with the under surface of the acromion (Case XL.). There was an articular capsule between the humerus and the inferior surface of the acromion. This latter was covered with fibrous tissue, the small humeral head which projected into the capsule is a small projection as large as a pea, which was lined with hyaline cartilage. Outside of the articulation osteophytic processes extended into the muscular insertions; the glenoid cavity was lined with fibrous tissue and connected with the humerus by bands of connective tissue.[91] The case was an old patient of Langenbeck (it is related by Luckie[92]). Of course, such occurrences interfere very much with the movements and may destroy the result of the operation.

54. *I. D. O. operated by resection is sometimes followed by anchylosis of the sectioned extremity of the humerus, under or inside the coracoid process.*

55. *I. D. O. operated and followed by anchylosis of the pseudo-joint*, due to hypertrophy or irregularity of the new ossification, is only seen in cases of subperiosteal resections. New resection may be attempted, but may not do much good, on account of the condition of the tissues of the region. If there is only one bony projection, it should be excised.

56. *I. D. O. operated and followed by dry arthritis of the pseudo-joint* is observed specially after reduction, but also after resection when the subperiosteal method has been followed and a new head has been formed. It should be treated on general principles, unless too painful, when a new resection has to be made, but extra-periosteally. After a few years they present modifications analogous to those of ordinary dry arthritis. The joint becomes stiff and cracks. This is especially observed in rheumatic and tuberculous subjects; in the latter, caries may develop.[56]

57. *I. D. O. operated by resection and a dangling arm* is often the result of an extensive resection or an unnatural condition of the muscles. Prothetic apparatuses place the arm in the same

condition as if it was anchylosed. When the distance between the resected humerus and the glenoid cavity is only six or seven centimetres, the extremity should be pared and stitched to the glenoid. When the distance is greater, the same should be done and the bone stitched as high up as possible. Bone-grafting may be very useful, especially fragmentary grafting. (Ollier.)

REMARKS CONCERNING THE OPERATIONS, ESPECIALLY BY RESECTIONS.

The following points, from able authorities, but mostly from the admirable book of Ollier,[93] should be well borne in mind by operators, especially in operations by resection. They are transcribed here, from a previous paper by the writer on anchylosis of the shoulder, for the convenience of the reader.[94]

Lagrange states that Boucher was the first who thought of resecting the upper extremity of the humerus, but it was White, of England, and Vigarous, in France, who performed the first operation.[95]

In 1789 a boy presented with his right hand to the Academy of Surgery the head of his right humerus, which had been resected by the surgeon-major of the regiment du Berri.[96] But Ollier asserts that Bent, of Newcastle, in 1771, was really the first who resected the humeral head.[97]

Post, of New York, in 1861, was the first to resect for irreducible dislocation; the next one was Warren, of Baltimore, says Ollier.[98] However, we report a case of Langenbeck dated 1858.

Ollier was the first to recommend (1858) the preservation of the capsule-periosteal sheath without cutting the muscles, as a means of obtaining a new joint, and, if possible, to cause the formation of a new head.

Langenbeck's incision, starting farther behind the internal border of the acromion, sacrifices the inervation of a greater portion of the deltoid.[99]

Ollier's rule is to expose the head by an incision as near as possible to the antero-internal border of the deltoid, and, if necessary, by the disinsertion of its internal portion.[100]

The incision should never be made internally (in axilla), on account of the nerves and vessels, except in rare cases of subglenoid dislocation, where the head projects near the skin.[101]

The deltoid is the most important of all the muscles, as is demonstrated by the cases of paralysis of the circumflex nerve, when the insufficiency of the muscles which are inserted on the head become evident.

The preservation of the circumflex nerve is also of great importance.[102] This nerve runs parallel to the posterior border of the acromion, from which it is distant in an ordinary adult by five and a half or six centimetres. This is important for the limit of perpendicular incision and for the incision for the drainage-tube behind.[103]

The loss of the elevating action of the deltoid must be accepted, like the loss of the rotating power from the division of the muscular insertions into the two tubercles, as a necessary consequence of resection of the head of the humerus. But the holding or supporting power of this muscle, exerted upon the whole of the upper extremity, owing to its position, its extensive origin, and the manner in which it embraces and protects the mutilated parts, as well as its faculty of carrying the arm backward and forward, are all functions which may still remain and serve the point to the great importance of preserving its integrity as fully as possible. The wasting of the internal fibres, however, seems a necessary result of resection by the single incision, but it has this compensating feature, that it is a less serious loss to the patient than an atrophied condition of the outer and posterior fibres would be, because the upper clavicular fibres of the great pectoral can take the place of the inner deltoid fibres to a considerable extent in supporting the shoulder and drawing it forward to the chest.[104]

The movements of elevation are seldom required, save by those who follow climbing occupations, as sailors, masons, etc.

The mode of performing the operation, as well as the operation itself, will naturally influence these movements. If the deltoid be cut completely across, by means of an elliptical incision, the power of abduction of the arm and its elevation may be

permanently lost. If its fibres be merely split by a longitudinal incision they may be preserved or regained in great part.[105]

The incision shall be as forward as possible, because all that portion of the muscle which will be to the inner side will be paralyzed. It is best to avoid the interdeltoido-pectoral groove on account of the cephalic vein; make the incision a little behind.[106]

In exceptional cases the clavicular portion of the deltoid may be disinserted—*i. e.*, by section of the insertion near the bone, without preserving the continuity with the periosteum. It is different from the subperiosteal detachment of the muscle done with the gouge.[70] The disinsertion of the clavicular portion of the deltoid, in part or in totality, is especially indicated when the head of the humerus is bound down and the arm cannot be separated from the chest.[107]

The relations of the large vessels and nerves must not be overlooked. However, in subperiosteo-capsular resections they run no risk as long as the operator remains within the capsulo-periosteal sheath.[108]

A great effort should be made always to recognize the tendon of the biceps and take care of it. If torn or cut it must be stitched back.

To obtain satisfactory results, especially in reductions, it is the portion of the capsule that the surgeon must get out of the way of the humerus and of the cup. Therefore, it is particularly behind the displaced head that he should dissect, and not so much in front as has been done heretofore.[110]

As one of the chief drawbacks of the operation is the poor amount of abduction and elevation which remains, owing, in a large measure, to the humerus being too short to be brought into the glenoid cavity when the deltoid acts, Holmes thinks that in this joint a trial of the subperiosteal method should be carefully made to insure as much reproduction of bone as possible.[109]

The resection should be done economically. First saw through the anatomical neck (see Kocher, No. 3, 1889). If the reduction is not possible saw a slice off and try then to reduce; if neces-

sary, saw off another slice, or saw through the surgical neck. When the humerus is put back in place it must be neither too loose, because there will result a flake limb, nor too tight, because it may become anchylosed, partially or totally; this is worse than a loose joint, and has often happened.[111]

It is impossible to say how much of the head must be resected to reduce the dislocation. Sometimes a superficial resection of the convexed articular surface is sufficient to replace the head, but it must be remembered that the head must be maintained in the cup. A resection below the head insures a better false joint. A too close resection may be followed by anchylosis.[113] Only the head of the humerus without any of the shaft should be removed. However, it is best to remove too much of the head than not enough. The subperiosteal method is the best; too much dissection of the bone may cause necrosis.[114]

Ollier says to be careful about the replacing of the extremity of the humerus, because the fibrous tissue might form a sort of interarticular cartilage between the end of the humerus and the cup. It will be well to stitch the fibrous tisues so as to form a sort of capsule.[112]

After the head has been resected the cup should be cleared, so as to make sure that the extremity of the humerus will readily remain in the cavity, otherwise that extremity itself may become displaced (or dislocated) under or inside the coracoid process.[115]

When feasible, the capsule should be restored as much as possible over the reduced head or over the resected extremity.

Ollier described several cases of reproduction of bone after the subperiosteal method.[116]

Langenbeck mentions a case in which the whole shaft of the humerus was necrosed and was removed, the elbow-joint was resected at the same time, and yet the reproduction of bone was so complete that the shortening was no more than one and one-fifth inches. The new humerus broke several times, but the movements of the shoulder and elbow were satisfactory, and the hand capable of the most delicate movements.[117]

In cases of rarefaction of the bones, it is important to seize

the head with strong tooth-forceps; ordinary forceps mash the head.[118]

The posterior drainage incision must be made at the most dependent part when the patient is lying down; this depends upon where the resection has been made. Care should be taken not to wound the circumflex nerve nor the artery. When the incision is made very low down, it is the musculo-spinal nerve that must not be wounded.[119]

It is best to place the tube even in cases where the bones are not diseased.[120]

In adults the rule is to push the resected extremity into the glenoid cavity when regeneration of the bone is expected.[121]

A thick pad should be placed in the axilla to prevent the humerus from being drawn inward.

The preservation of the deltoid roundness is a peculiarity of the subperiosteal resection.[122]

The following *remarks concerning the after-treatment* are most important:

The sooner the passive movements are begun the better, a few days after the operation, because the resected humerus may become anchylosed.[123]

The more the wound healing progresses the more the movements should be extended.[124]

The muscles, especially the deltoid, must be soon massaged and electrified.

It is especially in operations upon the shoulder that the after-treatment is of importance. Too much care cannot be given to that after-treatment; if incomplete or stopped too soon, almost all the benefits of the operation may or will be lost.[125] It must be kept up for weeks and even months.[126]

Extensive movements, especially those of abduction, should not be practised until several weeks after the humerus is sufficiently fixed in the glenoid cavity, lest the resected humerus may pass under the coracoid process, where it may form a coracoid articulation instead of a glenoid.[127]

The re-establishment of the complete mobility is retarded by thickening of the capsule, which in some cases is shrunken, and

in some points is as resistant as cicatricial tissue; also to the fibrous and fatty degeneration of the muscles.[128] This condition of the muscles is all the more difficult to overcome because the other muscles instinctively take their place, especially those that move the scapula.[129]

Rotary movements must be begun as soon as there is no pain.[130]

Electricity, massage and gymnastic exercises, must be conducted slowly, carefully but continuously, every day.[131]

Remarks concerning the final results are most interesting. In a number of cases of resection of the head operated on by Percy (1795) for various causes, the movements were all good except that of elevation, and the arm had to be rested against the chest to work the forearm, which then enjoyed all its strength.[132]

In order to appreciate the usefulness of the new joint, the following manœuvres should be practised. To measure the force of the abduction, *i. e.*, of the action of the deltoid, weights should be fastened to the elbow, and the patient directed to raise the elbow outward, first without and then after fixing the scapula. Then do the same with the weights attached to the forearm or placed on the hand.[133]

To measure the movements of rotation, flex the forearm against the anterior surface of the thorax, and place some object in the hand; then fix the elbow and make the hand describe the arc of a circle from inward outward, keeping the elbow well fixed.[134] In doing this we must watch the actions of the other muscles inserted in the humerus, which by the successive contraction of their various parts, may at a given time become rotators.[135]

The patient should be made to cross the arms, to place the operated arm behind the head, on the forehead, behind the back, on the buttock, throw a stone, etc.[136]

Some patients may perform some energetic movements and yet feel hampered in delicate movements requiring rotation. The resistance of a fibrous band or the existence of an abnormal projection on the new head explains these discrepancies.[137]

As for the conditions of the new joint, after resection from

various causes, out of 213 resections Gurlt observed 96 tight articulations, 21 anchylosis, and 76 dangling limbs.[138]

A few *remarks concerning the findings in the autopsies of operated cases* are now in order. In some cases there is formation of a new head, more or less irregular.[139] These gave an almost ideal result. In one case Testor found an intra-articular cartilage.[140]

Chaussier, Roux, Lyons, Breen, Hutchinson and others, have dissected articulations of shoulders resected from three months to twenty years. They all found a fibrous cord, strong and resistant, joining the humerus to the scapula, and adherent by its external surface to the surrounding soft parts, more or less atrophied. But they never found a real articulation.[141]

Ollier reports several cases of reproduction of bone after operation found at the autopsies.[142]

HISTORIES OF CASES OF I. D. O., SIMPLE, FORWARD, OPERATED THROUGH AN ANTERIOR INCISION BY ARTHROTOMY AND REDUCTION.

CASE I. *1820. Wattman.*[143] I. D. O. forward (infra-clavicular) anterior incision, arthrotomy and reduction, improved. Sex, ? age, ? *Diagnosis:* Infra-clavicular dislocation. *Duration:* Eleven months' standing. *Movements*, etc.: Paralysis, atrophy of muscles, pains. *Operation:* Vertical incision four inches in length, midway between the joint cavity and the dislocated head. After division of the anterior border of the deltoid, the head was at hand. *Difficulties and complications of the operation:* On the outer surface of the neck of the humerus was found an elevation allowing of but little displacement, which, on being examined, was found to be a broken off piece of the glenoid cavity. The glenoid cavity was filled with soft tissue; the surrounding soft parts had to be separated with a scalpel before room could be made in the joint cavity for the reception of the head of the humerus. Attempt to place the head in its normal site with the fingers was fruitless; supraspinous had to be incised to a point near its insertion into the humerus before it was possible to place the head in the nearly flat joint socket, using a lever pushed in between the head and the coracoid process, and resting on the fragments of the joint rim. *Complication after the operation:* The edges healed by primary intention, but much suppuration followed and burrowed along the arm and toward the

scapula. *Result immediate:* Healed gradually. *Result remote:* The movements which could be made by the patient at the time of his discharge (date not given) were still very limited; however, it was expected that by means of assiduous practice, which was urged upon the patient the motions would in the course of time grow more extensive. *Remarks:* Efforts at reduction were made immediately after the occurrence of the displacement, but failed.

CASE II. *1873. Lister No. 1.*[144] 1. D. O. forward (subcoracoid), anterior incision, arthrotomy and reduction (left side), result good. (There was an I. D. O. on right side which was treated by resection. See resections). Man, aged 23 years. *Diagnosis:* Subcoracoid dislocations of both shoulders. *Duration:* Seven months. *Movements*, etc.: He had absolutely no use of his arms; there was extreme atrophy of the muscles of the shoulder, however; there was considerable movement between the scapula and the body. *Operation on left shoulder:* Lister proceeds thus: The head being exposed by an incision beginning at the coracoid process, and prolonged along the pectoro-deltoid groove, he detached the capsule internally and externally to the surface of the insertion of the external rotator muscles. The detachment of the posterior portion of the capsule transforms the capsule into a flap, which the head can push asunder to return to its place. This proves that to obtain a satisfactory result it is the posterior portion of the capsule that the surgeon must get out of the way of the humerus and of the cup, and that it is behind the displaced head that he should dissect, and not in front, as has been done heretofore. With the aid of pulleys the head of the bone was returned to its normal position. *Difficulties and complications of operation: ? Complications after the operation: ? Result immediate:* The wound healed in six weeks. *Result remote:* Under the influence of passive motions, massage and galvanism, he improved so much that he could dress himself and perform the other acts of toilet, being no longer dependent upon others. *Remarks: ? Operation on right shoulder:* (Six months later. See Resections.)

CASE III. *1873, Lister No. 2.*[145] I. D. O. forward (subcoracoid), double, *i. e.*, on both sides simultaneously, anterior incision, reduction on both sides, result good. Sex: male. Age: 47 years. *Diagnosis:* Subcoracoid luxation of both shoulders. *Duration:* Nine and a half weeks. *Movements*, etc.: Unable to dress himself, arms almost fixed in slightly abducted position, and rotation very limited, partially on right side. *Operation on one shoulder, left side:* Incision from the coracoid process downward and somewhat outward in the interval be-

tween the deltoid and the pectoralis major. Divided the tendon of the subscapularis muscle at its insertion, and then with a periosteum detacher proceeded to separate the soft parts from the head of the bone and the inner part of its neck. *Difficulties and complications during the operation:* Made sure that the vessels were entirely detached from the bone; pulleys were applied; as the pulleys dragged on the humerus, some fibrous bands were felt to be put on the stretch; these were divided; the head of the bone still refusing to return to its normal position, the bone was completely cleared and pulleys again applied; this failing, the head of the bone was protruded through the wound as if for its resection, the external rotators having cut through at their insertions; pulleys again applied, direction and traction being altered from time to time by changing the position of the operating-table; pulleys were then suddenly relaxed by pulling a slip-knot arranged for that purpose, and at the same time rotation outward and adduction of the limb were performed; the head of the humerus was then brought nearer to the glenoid cavity; it went still nearer at the second attempt, and at the third slipped into its normal place. *Complications after the operation:* None. *Result immediate:* Good. *Operation on other shoulder:* Following week operated on other shoulder in similar manner except that I at once protruded the head of the bone dividing the attachments of all the rotators. In this instance at the second attempt the pulleys drew the bone into its proper position. *Complications after the operation:* None. *Result immediate:* The wound on this side, as on the other, remained without disturbance. *Result remote:* Five months after the operation patient presented with shoulders in their natural rounded form, and stated that he could do any hard agricultural work as well as ever. He exhibited all natural movements except elevation, which he could not do far above the horizontal; but states that he found improvement in that respect. *Remarks.* ?.

Case IV. *1874, Albert.*[146] I. D. O. forward (subcoracoid), anterior incision, arthrotomy and reduction, old fracture of surgical neck, results good.

Man ?; age ?. *Diagnosis:* Subcoracoid dislocation. *Duration:* ?. *Movements,* etc.: ?. *Operation:* Incision about eight centimetres, anteriorly, in such a manner as to have access to the region between the head of the humerus and the socket; divided many bands which stretched across; then began making rotary movements; the head moved nicely toward the socket. *Difficulties and complications of the operation:* The head was on the point of slipping back into this when

the neck of the humerus suddenly snapped; the head was drawn into the socket by using two steel hooks and pressing it into the socket; then the fragments were sutured together. *Complications after the operation:* ? *Result immediate:* ? *Result remote:* Formation of a pseudarthrose at the surgical neck, which, however, gave a useful limb. *Remarks* ?.

CASE V. *1878. Buckhardt* (*H.*).[147] I. D. O. forward (subcoracoid) with old fracture of tuberosity, anterior incision, arthrotomy, extensive muscular dissections, reduction, result good.

Female, age 48. *Diagnosis:* Luxation (forward and downward). *Duration:* Seven months. *Movements*, etc.: Marked atrophy of shoulder muscles. Movements of all parts of arm much limited. The upper arm was in a position of abduction, at an angle of 15°; was entirely immovable actively, and only very slightly movable passively. Patient suffered much from pain in arm and a feeling of heaviness; extent of pain did not correspond to special nerves. *Operation:* Incision 13 centimetres long half-way between acromion and coracoid process, through skin and deltoid. Incision continued along glenoid cavity, and on upper arm deepened for a distance of 3–4 centimetres, and then the fibrous tissue was all cut away. Glenoid cavity covered by a very thick layer of fibrous tissue which extended downward upon the arm without any apparent break; the freeing of the socket by dissection with scalpel and elevator extremely difficult on account of firm adhesions; no remains of cartilage were discovered; in the outer half of the layer which had been dissected away was the biceps tendon, forming an integral part of it; head bound down on all sides by dense connective tissue, also the portion of the shaft lying next to the rim of the joint; reduction impossible, even after freeing the head of the humerus; division of the muscular insertions on the inner surface to the extent of one or two centimetres; glenoid cavity was freed; head after manipulation and more separation from adhesions, and after cutting the insertions of muscles subperiosteally, was finally reduced. The greater tubercle, which had been broken off, was removed. Drainage-tube inserted through wound and brought out in back, and another inserted at lower angle of wound. Muscles and skin sewed up tight except where there were drainage-tubes. Arm put up in aseptic bandage with an axillary pad. *Difficulties and complications of the operation:* Due to the fibrous tissue about the cavity and head of the humerus and to the resulting adhesions which had taken place. One centimetre below the anatomical neck was extirpated an irregular

bony projection of the size of a bean, presenting rough prominences; this projection, which was situated in the fibrous tissue, was evidently the partially broken-off greater tuberosity. *Complications after the operation:* In order to lessen the pressure of the head on the socket, permanent extension was tried; but this had to be discontinued owing to too great discomfort from it. *Result immediate:* Wound remained septic until quite healed. Bandages had to be removed once or twice some hours after the operation because of red blood soaking through; four weeks after operation pus was still coming away from the drainage-tube which led up to the old site of the head. Front drainage wound closed three and a half weeks after operation. Eight weeks after the operation the posterior wound closed. One small stitch-abscess formed in first three weeks. Active and passive motions, carefully practised, were begun in the second week; after the eighth week they were practised with great boldness after the drainage opening had closed. *Result remote:* Three and a half months after the condition was as follows: the patient was free from pain; the arm could be raised in the horizontal plane through an arc of 45°, the elbow could be brought forward almost to the middle line of the thorax; posteriorly the right hand could reach the left iliac spine; she used her hand in eating or drinking, and combed her own hair. Passive motion was far more extensive. The most limited motion was that of external (outward) rotation (an arc of 10°–15°). The deltoid muscle was still markedly atrophied, but its contraction was plain to the eye. The head of the humerus was a little deep and somewhat nearer the median line than in the normal. After ten years there was no improvement on the above; the deltoid is completely atrophied, the shoulder markedly flattened, the head of the humerus smaller and pressed (jammed) against the inner and lower margin of the glenoid cavity; pressure over it causes pain; for instance, the patient cannot lie on that side. The woman can, without assistance, bring the arm so far forward that she places her hand on the occiput; then with the help of the other hand she can place it on the vertex so as to be able to dress her hair. Abduction can be performed through an arc of not quite 45°, and rotation is at a minimum. The muscular development of the arm, and especially the forearm, is great; the elbow and finger-joints are strong and fairly movable. She carries buckets of water and other heavy articles by preference with the affected side, as the extension of the arm thus produced is agreeable to her. *Remarks* ?.

CASE VI. *1878. Albert.*[148] I. D. O. forward (subcoracoid), anterior

incision, arthrotomy, reduction, result good. Woman, aged 45 years. *Diagnosis*: Subcoracoid dislocation. *Duration:* Five months. *Movements*, etc.: ? *Operation:* Incision anterior (?), the head was freed by careful dissection and replaced in the socket. Wound sutured. *Difficulties and complications of the operation:* ? *Complications after the operation:* ? *Result immediate:* Healing by first intention. *Result remote:* After the removal of the bandage motion was gradually restored. *Remarks* ?.

CASE VII. *1885. Socin.*[149] I. D. O. forward (subcoracoid or axillary), anterior incision (?), arthrotomy, reduction, then resection; result, improvement marked.

Man, aged 46 years. *Diagnosis:* Axillary dislocation. *Duration:* Six weeks. *Movements*, etc. ? *Operation:* Incision (?), arthrotomy and reduction. *Difficulties and complications of the operation:* ? *Complications after the operation:* The wound opened in the greater portion of its extent and suppurated freely. *Result immediate:* After four weeks there was found in the wound four distinct, completely loose necrotic fragments of bone of considerable size, which evidently belonged to the head of the humerus; resection of the upper extremity of the humerus; there being slight extensive infiltration of pus into the narrow cavity of the bone, hence "evidement" wound left opened and packed; fever followed; passive motion and electricity. *Result remote:* Wound finally healed fully, and the arm could be used pretty well. *Remarks:* The necrosis is noticeable.

CASE VIII. *1885. Schonborn No. 1.*[150] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, death.

Man, aged ? *Diagnosis:* Subcoracoid dislocation. *Duration:* Chronic. *Movements*, etc.: ? *Operation:* Anterior incision, division of the adhesions with three incisions; at length reduction was effected. *Difficulties and complications of the operation:* ? *Complications after the operation:* Delirium tremens and purulent bronchitis. *Result immediate:* Death. *Result remote:* ? *Remarks* ?.

CASE IX. *1885. Schonborn, No. 2.*[151] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result fair.

Man, aged ? *Diagnosis:* Subcoracoid dislocation. *Duration:* ? *Movements*, etc.: ? *Operation:* Incision (?), arthrotomy, reduction. *Difficulties and complications of operation:* ? *Complications after the operation:* ? *Result immediate:* ? *Result remote:* The arm could be moved through an arc of 50°; with the simultaneous movement of the

scapula the patient could put his hand on shoulder and back. *Remarks ?.*

CASE X. *1886. Pfeiffer.*[152] I. D. O. forward (intracoracoid), anterior incision, fracture of tuberosity, arthrotomy, reduction, result not stated.

Man, aged 42 years. *Diagnosis:* Head of the humerus in Mohrenheim's depression. *Duration:* About three months. *Movements*, etc.: Active motion almost entirely limited, passive slightly freer. Arm cannot be abducted. Rotation impossible and accompanied by pain. No disturbance of sensibility in whole arm; occasional shooting pains in the external cutaneous nerve, and a feeling of formication. Median and radial nerves intact; some dulling of sensation in the ulnar. Circumflex nerve seems to have been squeezed, since at times also there are shooting pains in its course, and also in the long thoracic nerve. *Operation:* Langenbeck's acromio-humeral incision for resection of the head, eight to ten centimetres in length, was made through the deltoid down to the bone. Capsule opened and glenoid cavity freed from it; the capsule had previously spread over it like a cover. Adhesions cut through and head of humerus laid freer. Humerus rotated, abducted, and elevated to break adhesions, and head brought into the cavity. Counter incision made on the under surface of the subscapular muscle. *Difficulties and complications of the operation*: These were due to stretching of the capsule over the glenoid cavity and adhesions, and also to a piece of bone or a cartilage which had been been chopped off from the head of the humerus and was not removed. During manipulation the tendon of the biceps was partially torn from its sheath, and, because of its tendency to slip in a median direction over the lesser tubercle, had to be fastened on the side, with catgut, to the surrounding connective tissue. *Complications after the operation:* None. *Result immediate:* Healed gradually. *Result remote:* Not noted. *Remarks* ?.

CASE XI. *1886 (?) Gurlt.*[153] I. D. O. forward (subcoracoid), anterior (?) incision, fracture of greater tuberosity, reduction (?), result, improved.

Sex, *?* age, *? Diagnosis: ? Duration: ? Movements*, etc.: *? Operation:* Arthrotomy. *Difficulties and complications of the operation:* The greater tuberosity was split off and caught in between the luxated head and the glenoid cavity at time of the accident, and so reposition was impossible. At operation the cause was found and removed. *Complications after the operation: ? Result immediate*: Wound healed soon. *Result remote:* Considerable limitation to normal movements.

CASE XII. *1886. (?) Blasius.*[154] I. D. O. forward (?), anterior incision (?), fracture of lesser tuberosity, arthrotomy, reduction, result, good.

Sex, male, age 17 years. *Diagnosis:* Dislocation of the shoulder, left side. *Duration:* Not given, only spoken of as old. *Movements*, etc.: Nothing said. *Operation:* Arthrotomy, reposition. *Difficulties and complications of the operation:* Small tubercle found broken off and removed. *Complications after operation:* Wound healed after five weeks. *Result immediate:* Nothing said. *Result remote:* Usefulness of the arm soon restored. *Remarks:* None.

CASE XIII. *1886. Maas (from Deus).*[155] I. D. O. forward (subcoracoid), anterior incision, arthrotomy and reduction, death.

Man, aged 42 years. *Diagnosis.* Subcoracoid dislocation. *Duration:* Four months. *Movements*, etc.: ? *Operation:* Incision of Langenbeck (acromio-humeral), ten centimetres long. *Difficulties and complications of the operation.* The capsular ligament was incised, the socket laid bare, and the bands immobilizing the head of the humerus, especially the strong, dense layers of the posterior surface, severed; the head was made free and brought back into its socket. *Complications after the operation:* Suppuration with dissection of the humerus. *Result immediate:* The patient died, evidently of septicæmia, twenty-seven days after operation. *Remarks ?.*

CASE XIV. *1887. Bruns, No 1.*[156] I. D. O. forward (subcoracoid), with fracture of greater tuberosity, anterior incision, arthrotomy, reduction, then resection, result fair.

Man, aged 43 years. *Diagnosis:* Axillary subcoracoid dislocation. *Duration:* Three and a half months. *Movements*, etc.: The arm is in a position of permanent abduction, the olecranon being twelve centimetres from the thorax; abduction was immediately followed by a return of the elbow to its wonted position; the arm could be easily rotated outward; it was longer than the normal by three centimetres. Active motion of the arm could not be performed. The head was wedged tightly in the anterior portion of the axilla; the deltoid convexity was flattened. *Operation:* Incision twelve centimetres, made downward from midway between the acromion and coracoid processes; next the capsular ligament stretched over the socket was dissected away and removed; the thickened capsule and periosteum were now removed from the humerus by means of the periosteotome; the tightly stretched biceps tendon now came into view about two-fingers' breadth

to the outer side of its normal position. *Difficulties and complications of the operation:* The bony mass now exposed was found to be a mass of callus of about the size of a hen's egg, including in its substance the fractured greater tuberosity; glenoid cavity filled with tissue; this was removed. After repeated attempts at reduction the head was finally, with great difficulty, pried into the socket by means of a Loffel spoon used in hip resections; the head was entire with the exception of the missing tuberosity, and had a good covering of cartilage. There remained a large cavity under the pectoralis major in the subcoracoid region, where the head had formerly rested. Drainage backward was provided for; sutures, etc. *Complications after the operation:* At the first dressing, seven days later, retention of pus was discovered, due to obstruction of the drainage course; pressure over the region where the head had been caused the discharge of a large quantity of thick pus. An incision was made directly over this region in order to secure immediate drainage. *Result immediate:* Continued discharge of pus. Two months and a half after the first operation the head was resected; two small sequestra from the humerus were discovered; the socket was surrounded by layers of connective tissue, which were also firmly attached to the head. *Result remote:* Ten days after the resection, etc., the drainage opening had closed. Massage and passive motion could be resorted to. Upon discharge from the hospital, three months after the first operation, abduction carried the olecranon to a distance of twenty centimetres from the axillary line; rotation could be performed through an arc of 22°; elevation forward through the same arc; backward not so far. Passive motion beyond these limits was still painful. *Remarks ?.*

CASE XV. *1887. Bruns, No. 2.*[157] I. D. O. forward (subcoracoid), with united fracture of neck, anterior incision, arthrotomy, reduction, later removal of necrotic fragments from head; result fair.

Man, aged 56 years. *Diagnosis:* Subcoracoid luxation. *Duration:* Two years' standing. *Movements*, etc.: Arm abducted; muscular system of the entire arm atrophied, patient could raise his arm to his head only by extraordinary effort and with the help of the sound limb; also posteriorly to the buttock; the middle finger was permanently flexed at the first interphalangeal articulation, but otherwise normal, as were the remaining fingers; the power of the hand was markedly diminished; the sensation was retained except in the second and third fingers, which presented analgesia and a velvety feeling; the radial pulse was smaller on this side. *Operation:* Anterior incision down to the head. *Diffi-*

culties and complications of the operation: The whole of the upper portion of the humerus was overgrown with dense connective tissue layers, so that it was difficult to free the head; the line of a united fracture of the surgical neck was discovered, together with a considerable callous thickening of the fractured greater tuberosity; all this gave to the upper extremity of the humerus a strong resemblance to the upper epiphysis of the femur. This callous growth was reduced to the size of a walnut, and the glenoid cavity cleared out with the sharp spoon; as the cartilaginous covering of the head was intact with the exception of a defective spot on the inner surface, due to the difficulty of prying out the bone, reposition was performed. Drainage-tube in axilla and one on the posterior aspect of the shoulder; catgut sutures, etc. *Complications after the operation:* One week after, the wound had healed all over by primary union; one week later, abundant suppuration through axillary opening, also retention of pus in the lower portion of the healed wound; incision, evacuation. *Result immediate:* Rapid decrease of the suppuration after the incision. *Result remote:* Discharged eight weeks after the operation; still two fistulæ from which a small quantity of thin pus is still being discharged upon any movement of the arm. Movements of rotation, as well as those forward and backward, could be performed both actively and passively, but they were limited in range and accompanied by distinct grating. The velvety feeling is present occasionally, but less frequently observed, and not so marked; the strength of the hand has improved very decidedly. Five months later, the patient says he can continually work at his calling (painter) without difficulty, though pus has been discharged from the still fistulous sinuses ever since; on several occasions splinters of bone had been discharged. The motion of the joint was right, ample and painless; the arm is still rather atrophied; there is a slight crepitation on passive motion; the axis of the humerus is normally directed, but the socket is empty; the probe came upon movable fragments of bone when passed through a fistulous opening in the scar. Incision of the scar showed that, of the entire head, only four or five necrotic fragments remained; these were removed and the granulating cavity curetted. In a few days the patient was discharged with the wound closed. *Remarks ?.*

CASE XVI. *1888. Garmany (J. J.).*[158] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good.

Man, aged 39 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Eight weeks. *Movements*, etc: Limited, being restricted to less

than 10°. *Operation:* Incision beginning just external to the coracoid process, and extending downward in the axis of the limb four or five inches; capsule opened; the long head of the biceps muscle was severed; coraco-brachialis and short head of the biceps partially divided; capsule found to consist of exceedingly dense, fibrous tissue, and it was necessary to divide it almost around the entire circumference of the head of the bone; opening made into the glenoid cavity, although the muscles (supraspinatus, infraspinatus and teres minor) were closely applied to it; tissues were separated and the head of the humerus directed through the opening until its articular surface rested against the glenoid cavity; head of bone tended to become dislocated and had to be held in position while the wound was stitched, drainage above and below, Velpeau bandage applied. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* In eight days the wound healed; Velpeau bandage retained for a month, when passive motion was commenced. *Result remote:* Two months after the operation he is able to earn a living as a blacksmith; movements scarcely less free than on the other side, strength of muscles has fully returned. *Remarks ?.*

CASE XVII. *1889–90. Kocher, No.* 7.[159] I. D. O. forward (intracoracoid), anterior incision, resection, result good.

Man, aged 60 years. *Diagnosis:* Intracoracoid luxation of the right shoulder. *Duration:* Ten months. *Movements*, etc.: Axis of the upper arm turned inward; movements of fingers free; sense of formication in palm of hand. *Operation:* Incision along edge of deltoid; separation of capsule from cavity to which it was firmly adherent; head reduced; drainage and corrosive dressing. *Difficulties and complications of the operation:* Only due to interposition of capsule between head and cavity. *Complications after the operation:* None. *Result immediate: ? Result remote:* One year after the operation patient could use arm for all sorts of work, mowing and chopping. However, there is not the same power in right arm as in left. Muscles, including deltoid, well developed. *Remarks ?.*

CASE XVIII. *1890. Vamossy.* I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good.

Man, aged 43 years. *Diagnosis:* Subcoracoid luxation of the left shoulder. *Duration:* Five months. *Movements*, etc.: ? *Operation:* Shoulder joint operated by an incision fourteen centimetres long, cutting through skin and deltoid muscle. Incision concave, convexity downward. Coraco-brachialis cut through and glenoid cavity freed of

fibrous tissue mass. Head reduced and capsule sewed over it with catgut. Coraco-brachialis united with catgut. *Difficulties and complications of the operation:* Glenoid cavity filled up with shrunken remnants of the capsule. The greater tubercle had to be cut off in order to unite the two ends of the deltoid over the head, when it was reduced. *Complications after the operation:* None. *Result immediate:* Wound healed by first intention. *Result remote:* Movements of the arm at the shoulder-joint, six months after operation, no better when he came into the hospital for operation. *Remarks ?.*

CASE XIX. *1891. Wolfler, No. 1.*[161] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction then resection, result fair.

Man, aged 37 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Six months. *Movements*, etc.: Patient can hardly raise the arm forward and outward to an angle of 45°; shoulder-muscles only partially atrophied; elbow- and wrist-joints free. *Operation:* Incision twelve centimetres long between the deltoid and the great pectoral, until the head of the humerus is met. *Difficulties and complications of the operation:* The head is surrounded by thick fibrous masses, adheres to the surrounding tissues and lies in a new cup; division of the adhesions; the glenoid cavity is filled with tissue, and the head lies in a new capsule; removal of these masses with the sharp spoon; immediately below the head was visible a well-healed fracture; the partially destroyed head is put into its proper place and fixed. *Complications after the operation:* None. *Result immediate:* The wound healed within a few days, but when passive movements commenced a fistula is found at the upper end of the scar which leads to the old cup, no improvement, resection of the head of the humerus by opening first incision; the head is only partially remaining, grayish-yellow in color, irregular in appearance, situated mostly in the old cup; large bone fragments also removed from the glenoid cavity; abscesses, pleuro-pneumonia and pericarditis; new abscesses on the shoulder; decrease of suppuration. *Result remote:* Electricity, exercises; recovery very slow; after two years patient can lift his arm forward and outward to a horizontal position by using the shoulder with it. *Remarks:* At the time of the accident a fracture below the head was diagnosed, but the dislocation was overlooked.

CASE XX. *1891. Gould.*[162] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good,

Man, aged 50 years. *Diagnosis:* Humerus dislocated below the

coracoid process, and the whole arm, forearm and hand, œdematous. *Duration:* A little over one month. *Movements*, etc.: Arm paralyzed; pain, vein compressed. *Operation:* An excision down on to the joint along the anterior border of the deltoid muscle, as if for excision of the shoulder, was made. *Difficulties and complications of the operation:* After dividing the subscapularis, supraspinatus, infraspinatus and teres minor tendons completely, with the aid of pulleys fixed to the arm, and a raspatory used as a lever to force out the head of the humerus, succeeded in replacing the head of the bone in the glenoid cavity; considerable force was requisite for this, so much so that a senior colleague advised me to excise the head of the bone. The wound was closed and dressed antiseptically. *Result immediate:* Healed by first intention. Pain was immediately relieved, and never returned; the œdema quickly passed off, and the muscular power was regained. *Result remote:* Three months later adhesions of the shoulder were broken down under gas. Full movement in the joint. *Remarks ?.*

CASE XXI. *1891. Cheyne (Watson).*[163] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good.

Man, aged 51 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Four months. *Movements*, etc.: ? *Operation:* Long incision along the anterior edge of the deltoid; defined it well and pulled it outward; the coraco-brachial, stretched on the head, was divided; also the subscapular at its insertion; division of fibrous bands and part of the great pectoral; head at length replaced in the glenoid cavity. *Difficulties and complications of the operation:* None. *Complications after the operation.:* None. *Result immediate:* Healed by first intetion; passive motion began the next day. *Result remote:* Nine months afterward the head was still in position, but seemed slightly further forward; patient has quite a useful arm, and was able do his work as a polisher, but he could not quite raise it to a right angle without moving the scapula. *Remarks:* None.

CASE XXII. *1892. Schede, No. 1.*[164] I. D. O. forward (subclavicular), anterior incision, arthrotomy, reduction, result improved.

Man, aged 31 years. *Diagnosis:* Subclavicular dislocation of the left shoulder. *Duration:* Thirteen weeks. *Movements*, etc.: Active movements very slight; deltoid paralyzed; passive motions also much limited. *Operation:* Incision along outer edge of dislocated head; muscles cut through, and also tendon of biceps; glenoid cavity freed of fibrous mass; head reduced. *Difficulties and complications of the operation:* Capsule was enormously thickened and tendon of the biceps

luxated and shortened; glenoid cavity seemed to have disappeared, and was completely obliterated by very firm, thick cicatricial fibrous mass; the extirpation of this was difficult and bloody; attempt failed to reunite tendon of the biceps. Wound sewed up and closed without drainage. *Complications after the operation:* None. *Result immediate:* Wound healed by primary union. *Result remote:* Ten weeks after operation passive motion was almost normal in extent; though there was crepitation in the joint. Use of forearm and hand was very free and strong; at shoulder all movements with the exception of elevation were good. Five months later, movements both active and passive were still better than in October; except for elevation, the deltoid was useless, and did not react to electricity. *Remarks ?.*

CASE XXIII. *1892. Schede, No. 2.*[165] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, apoplexy, death.

Female, aged 60 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Eight weeks. *Movements*, etc.: Arm much swollen and patient suffered severely with pain in the arm. *Operation:* Incision fifteen centimetres long, extending downward, from inner edge of acromion; capsule opened; incision into pocket where head had lain and drain from here backward under head through a counter incision; head reduced. *Difficulties and complications of the operation:* Glenoid cavity filled with fibrous tissue, the greater tubercle was found broken off, no callus at point of fracture. Capsule very much thickened, and there had been much hemorrhage into it. It had to be freed for some distance along the humerus. The glenoid cavity was filled with abundant granulating remains of the capsule, but its cartilage was well retained. *Complications after the operation:* Immediately on the narcosis, followed stupor, which became deeper and more complete all the time, and was finally associated with complete paralysis of the left side; six days later pneumonia developed and the patient died. *Remarks:* Patient had had an attack of epilepsy three months before accident. The dislocation was not recognized at first, and no attempt at reduction was made till patient entered the hospital.

CASE XXIV. *1893. Cotterill (J. M.), No. 1.*[166] I. D. O. forward (subcoracoid), anterior incision, reduction, result fair.

Male, aged 38 years. *Diagnosis:* Forward subcoracoid dislocation. *Duration:* Four months. *Movements*, etc.: Great impairment of movements. *Operation:* An incision about five inches in length was made over the coracoid in the interval between the deltoid and pectoralis major. The head of the bone was then seen lying below the coracoid

process, in direct contact with the large vessels and nerves and mostly covered by the pectoralis minor. This structure being divided, the head was carefully separated from its adhesions to the vessels and nerves, and reduction was attempted. *Difficulties and complications of the operation:* It was then found necessary to divide the tendons of the intraspinatus and supraspinatus muscles, also the long head of the biceps, before the bone could be brought opposite the glenoid cavity. A further difficulty was then encountered, for the glenoid cavity was found to be partially filled up with fibrous tissue, and the deltoid had acquired such adhesions by its under surface to this fibrous tissue that great force had to be employed to open up the glenoid cavity. The head of the bone was then replaced in proper position and a posterior counter opening made. *Complications after the operation:* None. *Result immediate:* Suppuration ensued, but the wound healed well eventually. *Result remote:* Patient left the hospital in August (came in April), with good movement in joint, less atrophy of the muscles, and no numbness or pain referable to pressure on the nerves; four months after leaving the hospital, motions backward were perfect, forward deficient: angle from the side 60°. Able to work as pointsman. *Remarks:*

Case XXV. [illegible] L. D. O. forward subcoracoid, anterior incision, with fracture of the glenoid cavity, arthrotomy, reduction, result good.

Man, aged 40 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Over one month. *Method, etc.:* *Operation:* Anterior incision. *Difficulties and complications in the operation:* Separation of the part of the anterior and lower edge of the glenoid, this cavity was found partly filled with new material, though not so completely occluded as in Case 2. Adhesions being divided, the head was reduced again with considerable effort into the glenoid cavity. *Complications after the operation:* Suppuration. *Result immediate:* The patient was [illegible] wound healed and great improvement [illegible] arm. *Result remote:* Four months after [illegible] healed, no pain or numbness; [illegible] prevented arm from [illegible] Same as Case 2. [illegible] subcoracoid). [illegible] reduction, result good.

Man, aged 38 years. *Diagnosis:* Luxation ?. *Duration:* One hundred and three days. *Movements*, etc.: ? *Operation:* Incision, antero-posterior, ten centimetres long, along the summit of the shoulder, and on its superior surface, two centimetres from the acromion, approaching apophysis in front and behind. Then the bone was cut through with a saw (?). At the anterior extremity of the incision a second was made, parallel to the axis of the arm, running alongside of the cephalic vein for a distance of eight centimetres. Capsule opened through its whole extent. Cicatrical tissue binding the head was cut away. Head reduced. Osseous sutures with silver wire; glenoid cavity was free, the capsule was whole. *Difficulties and complications of the operation:* Head of the humerus was bound down in its faulty position by many and strong adhesions. Hæmostasis by means of a rubber tube over the shoulder and under the axilla. *Complications after the operation:* A few drops of pus from the sutures. *Result immediate:* Wounds healed by first intention except for those few drops of pus, which ceased when the sutures were removed. *Result remote:* Twenty-two days after operation the patient could perform alone slight movements in elevation, adduction and abduction. *Remarks* ?.

CASE XXVII. *1893. Pollosson, No. 1.*[169] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good.

Man, aged 55 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Six months. *Movements*, etc.: ? *Operation.* Interdeltoido-pectoral incision; incision of capsule on same line; head easily reduced by traction and torsion. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Functional result almost perfect. *Remarks* ?.

CASE XXVIII. *1893. Pollosson, No. 2.*[170] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good.

Man, aged 52 years. *Diagnosis:* Subcoracoid luxation. *Duration:* Six weeks. *Movements*, etc.: ? *Operation:* Interdeltoido-pectoral incision, head reduced by traction and torsion. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* At the end of three weeks head in place, no anchylosis, final result good. *Remarks* ?.

CASE XXIX. *1893. Pollosson, No.* 3.[171] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result good.

Man, young. *Diagnosis:* Subcoracoid dislocation. *Duration:* ?

Movements, etc.: ? *Operation:* Anterior incision, arthrotomy, reduction. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Good. *Remarks* ?.

CASE XXX. *1893. Pollosson No. 4.*[172] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, later resection, result not stated.

Woman, aged 60 years. *Diagnosis:* Subcoracoid (?) dislocation. *Duration:* Three months. *Movements*, etc.: ? *Operation:* First anterior incision; second transverse subacromial involving the anterior third of the deltoid. *Difficulties and complications of the operation:* None. *Complications after the operation:* Suppuration. *Result immediate:* Suppuration; head became necrotic and had to be resected. *Result remote:* Not stated. *Remarks* ?.

CASE XXXI. *1893. Pollosson No. 5.*[173] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, sepsis, death.

Man, aged 64 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Two months. *Movements*, etc.: ? *Operation:* Two incisions as in Case IV. *Difficulties and complications of the operation:* Some venous hemorrhage from possible injury to the axillary vein; reduction very tedious. *Complications after the operation:* Suppuration. *Result immediate:* Sepsis. *Result remote:* Death from sepsis. *Remarks* ?.

CASE XXXII. *1893. Cheyne (Watson).*[174] I. D. O. forward (subcoracoid), anterior incision, arthrotomy and reduction, result good.

Woman, aged 18 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Nine months. *Movements*, etc.: ? *Operation:* Long incision from coracoid process downward between the pectoral and deltoid muscles; the inner fibres of the deltoid were detached from the humerus so as to get a better view; the long head of the biceps, which was in the way, was temporarily removed from its groove; the greater portion of the subscapular divided at its insertion and some fibres of the supraspinous; head of bone then easily replaced after clearing out the glenoid cavity; tendon of the biceps put back in its groove. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Healing by first intention; passive motion begun on the twentieth day; full range is easily obtained under an anæsthetic. *Result remote:* Four months after operation can raise the arm easily to do back hair, and this movement was improving, other movements quite good. *Remarks:* None.

CASE XXXIII. *1893. Poncet.*[175] I. D. O. forward (subcoracoid), anterior incision, arthrotomy, reduction, result fair.

Man, aged ? years. *Diagnosis:* Subcoracoid dislocation. *Duration:* ? *Movements*, etc.: Compression of brachial plexus, rapid atrophy of the muscles of the arm. *Operation:* Incision (?), new capsule thick and resistant; incision of this capsule; clearing of the tendon of the biceps and coraco-brachial; easy reduction of the head in the healthy glenoid cavity. *Difficulties and complications of the operation:* None. *Complications after the operation*: None. *Result immediate:* Rapid healing. *Result remote:* Five months afterward the patient can carry a bucket of water; the head, however, had slipped slightly below the glenoid cavity; the atrophy of the deltoid persists; the other muscles have recovered their size. *Remarks:* None.

CASE XXXIV. *1893. MacCormac (Sir W.).*[176] I. D. O. forward (subcoracoid), with fracture of the tuberosity, anterior incision, arthrotomy, reduction, later resection, result good.

Man, aged 40 years. *Diagnosis:* Subcoracoid dislocation, with fracture of the greater tuberosity. *Duration:* Three months. *Movements*, etc. ? *Operation:* Incision interdeltoido-pectoral; arthrotomy, reduction. *Difficulties and complications of the operation:* The greater tuberosity had been fractured and a mass of callus had formed; also the anterior third of the glenoid cavity had been detached from the balance; the posterior portion of the cup was filled with fibrous tissue and the old capsule; the cavity was cleaned and the head reduced; the cartilage of the head of the cup seemed normal. *Complications after the operation:* Suppuration. *Result immediate:* The pain and suppuration persisting, the head is resected through the anatomical neck. *Result remote:* Perfect cure (no details given). *Remarks* ?.

CASE XXXV. *1895. Souchon (Edmond).*[177] I. D. O. forward (subcoracoid), anterior incision, arthrotomy and reduction, shedding of cartilage, result death.

Man, aged 52 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Three months. *Movements*, etc.: Paralysis of all the muscles of the shoulder and arm; he can move the forearm some and flex the fingers; complete loss of sensation, except on the posterior aspect of the arm; hand œdematous. *Operation:* Anterior incision near the anterior border of the deltoid; incision through the capsule; its walls are hard and about one-quarter of an inch thick; incision around the head until it is freed; head normal, also glenoid cavity; reduction accomplished with a little force; drainage-tube behind. *Difficulties*

and complications of the operation: None. *Complications after the operation:* Suppuration. *Result immediate:* Relief from pain; disappearance of the œdema. *Result remote:* Suppuration considerable; at two different times pieces of cartilage of the head were removed from the wound while irrigating it. There is a little more motion; seven weeks after the operation all the wounds were closed; patient nourishes badly, grows weaker and finally dies; his peritoneum presents miliary tubercles in the region of the left iliac fossa. The posterior part of the capsule has folded under and was between the head and glenoid cavity. *Remarks:* None.

CASE XXXVI. *1895. Reboul (J.).*[178] I. D. O. forward (subcoracoid) anterior incision, arthrotomy, reduction, result good.

Woman, aged 42 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Fifty-four days. *Movements*, etc. ? *Operation.* Double incision (transverse and longitudinal); then arthrotomy and reduction. *Difficulties and complications of the operation:* Capsule adherent in front of glenoid cavity and head; also on posterior part; thick fibrous bands bound the head down; tendon of biceps moved out of the way, cup cleared; the head is made to rest by the posterior superior portion of the anatomical neck on the antero-inferior edge of the glenoid cavity; by the combined movements of abduction and rotation, with pressure upon the head with the fingers and with a periosteotome as a lever, the head is reduced, but after much difficulty; the dissection in front, near the vessels, long and tedious; capsule restored, suture of sheath of tendon of the biceps. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Good. *Remarks:* None.

CASE XXXVII. *1897. Tuttle (J. P.).*[179] I. D. O. forward (subclavicular), anterior incision, reduction, result good.

Man, aged ? years. *Diagnosis:* Subclavicular dislocation. *Duration:* Two months. *Movements*, etc.: Had no use of the arm whatever. *Operation:* Attempt at reduction under ether, but as soon as the head was brought nearly within the glenoid cavity something would act so as to pull it back to its former position. Cut down on the head, found that the head of the bone had passed around the coraco-brachial ligament in such a manner that when it was brought nearly within the cavity the ligament would jerk it out like the string of a bow; reduction was easily effected in replacing the ligament. *Complications after the operation.* ? *Result immediate.* ? *Result remote:* Has good use of his arm. *Remarks* ?.

CASE XXXVIII. *1897. Parmenter (John).*[180] I. D. O. forward (subcoracoid), anterior incision, reduction, improved.

Woman, aged 40 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Two and a half months. *Movements*, etc. ? *Operation:* Anterior incision and reduction. *Difficulties and complications of the operation:* After considerable difficulty the tendons of the subscapular and supra- and infraspinatus having been divided, the head was easily returned to the socket; the cup seemed nearly normal. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Left the hospital much improved and returned to farm-work which involved heavy lifting; this was soon followed by pain, disability, swelling, crackling, and sensation of slipping in and out; arm cannot be raised without help. Later, patient fell and struck elbow; something cracked, pain and disability suddenly ceased, so that now the hand can be carried anywhere in all directions. *Remarks.* It would seem as though the patient by returning to work too soon produced at least a partial dislocation of the joint, that this became more or less fixed in this normal position until the accident, which caused reduction of the partial dislocation. It would seem, therefore, that too early use of the part, especially heavy lifting, should not be indulged in by patients on whom free division of supporting structures had to be performed.

CASE XXXIX. *1897. Ransohoff (Joseph).*[181] I. D. O. forward (subclavicular), anterior incision, arthrotomy, reduction, result good.

Man, aged 21 years. *Diagnosis:* Subclavicular dislocation. *Duration:* Three and a half months. *Movements*, etc.: Muscles of limb considerably atrophied; abduction of elbow from side of the body impossible beyond an angle of 30°; unable to get his hand to the back. *Operation:* Incision about six inches in length from over the coracoid process downward and outward on the line of the humerus and between the fibres of the deltoid. *Difficulties and complications of the operation:* By means of elevation and cutting with the scissors the adhesions surrounding the head were broken off and it was denuded, but with great difficulty; cartilage of the head unchanged, glenoid fossa filled in its lower part with exuberant granulations, which were removed with a sharp spoon; they were tough and bled freely; the central part of the cup was crossed with normal cartilage, reduction failed until capsule was divided in its entire circumference and the humeral neck exposed to the lower borders of the tuberosities; reduction easily maintained. *Complications after the operation:* Slight fever. *Result immediate:*

Primary union. *Result remote:* Functions very much improved; rotation fairly practicable, but arm cannot be elevated from the side of the body at more than an angle of about 45°; atrophy of the muscles has not been improved. *Remarks* ?.

HISTORIES OF I. D. O. AND FORWARD, TREATED THROUGH AN ANTERIOR INCISION BY RESECTION.

CASE XL. *1858. Langenbeck.*[182] I. D. O. forward (subcoracoid, with old fracture of greater tuberosity), anterior incision, resection, improved.

Man, vigorous, aged 41 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* One year. *Movements*, etc. ? *Operation:* Anterior incision (?), resection. *Difficulties and complications of the operation:* It was found that there had been a fracture of the greater tuberosity with displacement, which had united. *Complications after the operation:* Erysipelas and copoius suppuration. *Result immediate:* After three months the wound finally healed. *Result remote:* Four years later Luckie observed a displacement of the humerus under the acromion process; the arm could not be lifted to the horizontal plane; the movements of the forearm and hand were strong and free. *Remarks:* There was at first a fracture of the arm, and after union had taken place a dislocation of the shoulder, probably dating back to the same injury, was observed; attempts at reduction were unsuccessful.

CASE XLI. *1862. Langenbeck.*[183] I. D. O. forward (axillary or subcoracoid), with fracture of lesser tuberosity, anterior incision, resection, death.

Man, aged 46 years. *Diagnosis:* Axillary (subcoracoid ?) dislocation; examination revealed also the presence of a small piece of bone separate from the humerus under the coracoid process; the fragment did not move with the humerus, which proved to be a fracture of the lesser tuberosity. *Duration:* Three months. *Movements*, etc.: ? *Operation:* Antero-interne incision and resection. *Difficulties and complications of the operation:* Great difficulty in removing the head, owing to strong adhesions and to the fracture of the lesser tuberosity. *Complications after the operation:* Pyæmia. *Result immediate:* Patient died on the eleventh day. *Remarks* ?.

CASE XLII. *1868. Paget.*[184] I. D. O. forward (subcoracoid), with old fracture of the surgical neck; semilunar incision or median incision, resection, result not stated.

Man, age, adult. *Diagnosis:* Subcoracoid dislocation (head of the humerus forward), united fracture as well as dislocation. *Duration:* Twelve months. *Movements*, etc.: Humerus quite immovable. *Operation:* Semilunar incision from near the outer end of the clavicle to the tip of the acromion, and down the arm an inch or two. *Difficulties and complications of the operation:* Operation long and tedious; great difficulty from the bony connections, which stretched not only from the head, but also from the shaft of the humerus to the glenoid cavity and the neck of the scapula; there must have been fracture about the neck extending down the bone, a large amount of callus helping to fix the head of the bone firmly in its unnatural position. *Complications after the operation:* Not stated. *Result immediate:* Not stated. *Result remote:* Not stated. *Remarks* ?.

CASE XLIII. *1869. Warren.*[185] I. D. O. forward (subcoracoid), V-incision, resection, good result.

Female, aged 50 years. *Diagnosis:* Subcoracoid dislocation; head of the humerus pressing against the brachial flexus of nerves, some of the trunks of which seemed to have been dragged forward by the bone. *Duration:* One year. *Movements*, etc.: Limb fixed useless; excruciating pain. *Operation:* The V-shaped incision of Sabatier, as modified by Gayrand, was made in the premises; preservation of tendon of biceps; humerus was divided through the surgical neck, its head removed and the excised shaft carried back to the glenoid cavity. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Wound healed rapidly and well. *Result remote:* Some months later the humerus was well up toward the glenoid cavity, action of the deltoid in a great measure lost, arm could be elevated to head; considerable latitude of motion had been restored; patient could sew and feed herself. *Remarks* ?.

CASE XLIV. *1872. Reid.*[186] I. D. O. forward (axillary), with fracture of the greater tuberosity; anterior incision, resection, result good.

Man, aged 20 years. *Diagnosis:* Axillary dislocation; the arm stood out from the body; abduction was impossible; forward and backward movements were also very limited, so that the arm was useless; patient could seize and press with his hands. *Duration:* Two months. *Movements*, etc.: Feeling of numbness in the fingers. *Operation:* Incision over the head, six or seven centimetres in length, about a thumb's breadth from the outside of the coracoid process; after incision of the remnants of capsule and of the muscular insertions, the

head was easily isolated; the bone was sawed through at the surgical neck. *Difficulties and complications of the operation:* On the resected head was found the fractured greater tuberosity driven at an abnormal angle into the spongy substance of the head. *Complications after the operation:* Suppuration. *Result immediate:* Healed in four weeks. *Result remote:* After two months, movements of the arm were pretty fair; it could be raised to a right angle; the muscles of the arm were well developed; shortness of three centimetres; full strength in the hands and fingers; numbness gone. *Remarks* ?.

CASE XLV. *1874. Thiersch.*[187] I. D. O. forward (intracoracoid); fracture of the humerus in middle in attempting to reduce before cutting; anterior incision, (?) resection, result improved.

Woman, aged 48 years. *Diagnosis:* Intracoracoid dislocation (inward and forward). *Duration:* Six weeks. *Movements*, etc. ? *Operation:* Attempt to reduce led to fracture of the humerus in its middle. *Difficulties and complications of the operation:* The attempt to free the exposed head and reduce it was thwarted by the short, dense adventitious growths, which could not be divided without jeopardizing the axillary nerves and vessels stretched over the head, hence resection. *Complications after the operation:* Suppuration. *Result immediate:* Very slow healing; fracture had united in the third week. *Result remote:* At the time of discharge there was moderate usefulness of the arm. *Remarks* ?.

CASE XLVI. *1875. Langenbeck.*[188] I. D. O. forward (axillary, *i. e.*, subcoracoid), with old fracture of greater tuberosity; anterior incision (?), improved slightly.

Man, aged 45 years. *Diagnosis:* Axillary dislocation. *Duration:* Five months. *Movements*, etc.: Very limited in all directions, symptoms of pressure on the brachial plexus. *Operation: ? Difficulties and complications of the operation:* The greater tuberosity was found broken off. *Complications after the operation:* None. *Result immediate:* The wound healed by primary union (?) six weeks after the operation. *Result remote:* Although the muscles reacted well to electricity, the usefulness of the arm was found but slighty improved. *Remarks ?.*

CASE XLVII. *1875. Annandale*[189] I. D. O. forward (subclavicular), anterior incision, ligation of the axillary artery, resection of head piecemeal, death.

Woman, 60 years. *Diagnosis:* Subclavicular dislocation. *Duration:* Six weeks. *Movements*, etc.: Much pain. *Operation:* Incision along the anterior portion of the deltoid. *Difficulties and complications*

of the operation: Impossibility to free the head and replace it in its socket; division of the bone at the surgical neck and removal of head piecemeal, it was firmly adherent to the ribs; wounding of the posterior circumflex; it was tied, but the ligation cut through, owing to endoarteritis, and the stump of the vessel being only an eighth of an inch long, the axillary artery was tied above and below. *Complications after the operation:* Gangrene followed. *Result immediate:* Death on third day. *Remarks ?.*

CASE XLVIII. *1876. Israel.*[190] I. D. O. forward (subcoracoid), anterior incision (?), resection, secondary hemorrhage; death.

Man, aged 60 years. *Diagnosis:* Subcoracoid dislocation. *Duration: ? Movements,* etc.: The dislocation was accompanied by complete anæsthesia and paralysis of the parts supplied by the ulnar nerve; the whole arm feeling like a dead weight. *Operation:* Resection. *Difficulties and complications of the operation: ? Complications after the operation:* A secondary hemorrhage occurred. *Result immediate:* Patient died from the hemorrhage.

CASE XLIX. *1876. Weinlechner.*[191] I. D. O. forward (intracoracoid), anterior incision, resection, improved.

Female, aged 76 years. *Diagnosis:* Luxation of right shoulder inward from the coracoid process. *Duration:* Six months. *Movements,* etc.: Loss of power in arm, associated with severe pain radiating into the hand. *Operation:* Long incision through the deltoid muscle and breaking up of adhesions about the glenoid cavity; resection of the head, another incision for drainage at lowest point of the axilla, drainage-tube, etc. *Difficulties and complications of the operation:* Only due to adhesions on anterior surface of the shoulder-blade close to the edge of the glenoid cavity. *Complications after the operation:* Some suppuration; six weeks after the operation slight suppuration of arm. *Result immediate:* Wound healed slowly; after operation the end of the resected humerus was two centimetres below the coracoid process. *Result remote:* Passive movements were limited in all directions; the arm can hardly be raised to the chin, or brought beyond the right trochanter, abduction only to a right angle; no more pain. *Remarks ?.*

CASE L. *1878. Reid.*[192] I. D. O. forward (subcoracoid), anterior incision, resection, result good.

Man, aged 34 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Eighteen months. *Movements,* etc.: Movements of shoulder-joint very limited; in active motion the arm could be brought forward

but little; outward not at all, backward a little; passive motion could bring the arm forward to an angle of 45°; abduction separated it by two centimetres; the backward movement was also very limited; on free manipulation, grating and snapping could be plainly detected; the arm was three centimetres longer than the normal; it appeared a little cyanosed and cooler; no disturbance of sensation. *Operation:* Incision two centimetres over the luxated head through skin and muscle; incision of the capsule, separation of muscles and tendons close to the bone; division of the bone at the surgical neck with a chain saw. Wound sutured, and upper extremity bandaged and fixed to the limb with the forearm fixed at right angles. *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate:* Wound healed in ten days. A few days later many varieties of gymnastics were practised. *Result remote:* Four and a half months later passive motion can be practised. *Remarks ?.*

CASE LI. *1880. Reid.*[193] I. D. O. forward, double (subclavicular) incision, resection on both sides, result very good.

Man, aged 53 years. *Diagnosis:* Double subclavicular dislocation. *Duration:* Eight months. *Movements*, etc.: Complete uselessness of both upper extremities; the patient was not able to eat or drink alone; when lying he could not sit up or turn. OPERATION ON RIGHT SIDE: Resection of right head was first performed; nearly three centimetres below the surgical (?) neck. *Difficulties and complications of the operation:* The resection was effected with much difficulty. *Complications after the operation:* The healing was suppurative. OPERATION PERFORMED ON LEFT SIDE: Two and a half months after the first resection the second was performed. *Difficulties and complications of the operation: ? Complications after the operation:* Suppuration. *Result immediate:* Healing tedious, discharge of sequestra, gymnatic exercises. *Result remote:* Seven months after the first operation the patient could reach the forehead with his hands, could eat without help; rotation could be performed in some slight degree; abduction was limited. Six years and a half later the man is employed as a maltster in a brewery, enjoys splendid use of his arms. In weighing the sacks, he could lift a hundred weight one-half meter from the floor upon the scales; he needed no help in dressing, combing, eating, etc. The movements of the humerus, abduction, forward and backward movements, and specially rotation, were much more free and strong on the left than on the right arm; the muscular development of the left arm was below normal, but in a much less atrophic state than that of the

right. The upper extremity of the resected humerus was rounded and somewhat globular on the left; in the glenoid cavity on either side. *Remarks ?.*

CASE LII. *1880. Marsh (Howard).*[194] I. D. O. forward (?), resection. Result ?.

Man, aged ? years. *Diagnosis: ? Duration:* Old. *Movements,* etc.: Atrophy of muscles; enduring agonizing pain. *Operation:* First rupture of the adhesions was tied without success; then nerve-stretching, but with equally poor success; finally, resection performed. *Difficulties and complications of the operation:* The nerve-stretching was done with much difficulty. *Complications after the operation:* ? *Result immediate:* Neuralgia continued. *Result remote ?.*

CASE LIII. *1881. Hofmokl.*[195] I. D. O. forward (subcoracoid), incision (?), resection, result good.

Man, aged 31 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Three months. *Movements,* etc.: Head of the humerus joined to capsule by malformation, anchylosed; every movement of the arm is attended by motion of the scapula. *Operation:* Incision, Roberts' operation, resection of the head. *Difficulties and complications of the operation:* The head was found to be fixed to the glenoid cavity by strong adhesions, which were removed subperiosteally as much as possible; severe parenchymatous hemorrhage; Lister's dressing. *Complications after the operation:* The first three days the bandage had to be removed daily on account of the hemorrhage. *Result immediate:* Primary union on the fifth day; gymnastics, electricity, etc. *Result remote:* Three months after the operation the patient can execute all active movements with the arm, both in the shoulder and in the elbow; he could lift moderately heavy objects, he could also write, which was impossible before the operation. *Remarks ?.*

CASE LIV. *1882. Schonborn.*[196]. I. D. O. forward (subcoracoid), anterior incision (?), resection; result improved.

Girl, young. *Diagnosis:* Forward, subcoracoid dislocation. *Duration:* Twenty weeks. *Movements,* etc.: ?. *Operation:* Anterior incision (?), resection. *Difficulties and complications of the operation: Complications after the operation:* ? *Result immediate: Result remote:* Eight months later could put her hand on the opposite shoulder; movements backward very limited, and on application of massage and electricity the muscles did not grow any stronger. *Remarks* ?.

CASE LV. *1883. Book.*[197] I. D. O. forward (subcoracoid), incomplete, anterior incision (?), resection, result good.

Female, aged 26 years. *Diagnosis:* Incomplete subcoracoid dislocation. *Duration:* Four months. *Movements*, etc.: Disuse of arm and great pain. *Operation:* Incision (?), the head of the bone is resting on the anterior rim of the glenoid cavity; it was unchanged. *Difficulties and complications of operation:* None. *Complications after the operation: ? Result immediate: ? Result remote:* Marked improvement. *Remarks* ?.

CASE LVI. *1886. Pfeiffer.*[198] Forward, with fracture of the greater tuberosity, anterior incision (?), resection or reduction (?); result good.

Man, aged ? *Diagnosis:* ? *Duration:* ? *Movements*, etc.: ? *Operation:* Incision (?), arthrotomy; reduction (?) or resection ?. *Difficulties and complications of the operation:* The greater tuberosity was broken off and wedged between the dislocated head and the joint cavity; it was removed. *Complications after the operation: ? Result immediate:* ? Healing readily. *Remarks ?.*

CASE LVII. *1887. Bellamy.*[199] I. D. O. forward (?) (subcoracoid), chronic arthritis of pseudo-joint; resection, result good.

Male, aged 16 years. *Diagnosis:* Old standing dislocation. *Duration:* Three years. *Movements*, etc. Arthritis and suppuration due to manipulations to replace; four sinuses have formed. *Operation:* Incision anterior (?), making use of the existing sinuses; resection of the head; long head of the biceps removed with the head, as it was too much implicated to be saved; glenoid cup scraped with sharp spoon; also the sinuses. *Difficulties and complications of the operation: ? Complications after the operation:* Suppuration. *Result immediate:* Short suppuration. *Result remote:* Good. *Remarks ?.*

CASE LVIII. *1887. Billroth.*[200] I. D. O. forward (?), anterior incision, resection, result improved.

Man, aged — years. *Diagnosis:* ? *Duration:* ? *Movements*, etc.: There was complete paralysis of arm. *Operation:* Incision, (?) typical resection. *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate: ? Result remote:* Considerable improvement in the functions of the arm, although, as might be expected, there was not complete cure of the paralysis. *Remarks ?.*

CASE LIX. *1888. Ollier.*[201] I. D. O. forward (intracoracoid), anterior incision, resection, result good.

Man, aged 27 years. *Diagnosis:* Intracoracoid dislocation. *Duration:* Five months. *Movements*, etc.: They cause much pain, pressure also causes pain; owing to this arthritis all interference is delayed

until it is allayed. *Operation:* Longitudinal incision along the anterior border of the deltoid; in the interdeltoido-pectoral grooves; head found under the coracoid process; after cutting the fibrous bands felt by the fingers an attempt is made to reduce the dislocation, but failed; long incision of the capsule; the coracoid process had produced a deep indentation on the head; head was cleared subperiosteally and forty-three millimetres of the head and shaft were removed. Glenoid cavity mashed by fibrous tissues (capsular buttonhole) gathered upon themselves; incision through the mass; cup lined with its cartilage of a white-yellow aspect, fibrous, so thickened in the centre as to fill the cavity and transform it into a plane surface almost convex. *Difficulties and complications of the operation:* The extent of the adhesions is such that it would require so very extensive dissection to reduce that it was thought best to resect; it required much dissection to reduce the sawed extremity of the bone; there is some difficulty in keeping the extremity of the sectioned humerus in the glenoid cavity, as it is drawn inward by the abductor muscles retracted so long by the nearing of their attachments; the extremity has a constant tendency to go under the coracoid process, the elbow must be brought on the chest and raised to keep the extremity in the cup; posterior drainage. *Complications after the operation:* None. *Result immediate:* Process of repair uninterrupted; on the fifteenth day passive motion was begun. *Result remote:* A strong and mobile joint was formed; on leaving the hospital the patient could separate elbow fifteen centimetres from body, and his arm was so strong he wanted to resume work. He could easily carry his hand back of his thigh of the sound side and execute the movements of his profession (harness-making). Seen ten months later, the head of the humerus is well fixed against the glenoid cavity, and there is no tendency to luxation when the patient separates his arm from his body. The top of the humerus is higher than the coracoid process. Passive movements are not more extensive than the active. His arms can be extended in the form of a cross, but the one operated upon stands somewhat forward of the other. Movements of abduction are limited by the formation of fibrous tissue purposely allowed to organize after the operation. The deltoid contracts energetically, but is still atrophied. Movements of rotation inward are good, but limited outward. Elevation of arm is good. *Remarks:* None.

CASE LX. *1888. Shield.*[202] I. D. O. forward (subcoracoid), resection; result good.

Man, aged 45 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Twelve weeks. *Movements*, etc.: Marked ulnar nerve paralysis, both motor and sensory; also of the median nerve, but not as much; radial pulse much diminished; complete loss of power of the hand. *Operation:* Anterior incision. *Difficulties and complications of the operation:* The head was found at a great depth surrounded by fibrous adhesions; it was finally cleared and drawn out and divided from the shaft at the level of the anatomical neck. *Complications after the operation: ? Result immediate:* Patient made a good and uninterrupted recovery; the radial pulse resumed its ordinary strength immediately after the operation; three days after the operation the sensory paralysis of the median and ulnar nerve had almost disappeared. *Result remote:* Twelve weeks after the operation, after the use of massage and galvanism, the atrophied muscles had in part been restored, the muscles of the shoulder were satisfactory, the arm and hand can be used freely in the exercise of his vocation (hotel tapster). *Remarks ?.*

CASE LXI. *1889. Finckh.*[203] I. D. O. forward (subcoracoid), with united fracture of greater tuberosity, anterior incision, resection, result good.

Man, aged 46 years. *Diagnosis:* Axillary (subcoracoid), luxation of right shoulder. *Duration:* Three months. *Movements*, etc.: ? *Operation:* Resection of head of the humerus. *Difficulties and complications of the operation:* During operation there was found a piece of bone, about the size of a hen's egg, which, surrounded by a covering of thick connective tissue, was attached to the anterior surface of the shaft of the humerus below the surgical neck; it was the greater tubercle which had been broken off, and which by a callous growth was firmly attached to the humerus. The tubercle was removed; the head of the humerus was dislocated from its newly formed cavity and its surface was found intact. The glenoid cavity was still covered by well-preserved cartilage. The head of the humerus was resected at the surgical neck and the shaft pressed into the glenoid cavity. The wound closed. *Complications after the operation: ? Result immediate*: Healing by first intention. *Result remote:* Two and a half weeks after the operation the patient began active movements, which soon became free, with the exception of outward rotation, which of all the movements was carried out worst. *Remarks:* Three attempts at reduction had been made unsuccessfully before operation.

CASE LXII. *1889. Fenger.*[204] I. D. O. forward (intracoracoid), anterior incision, resection, result fair.

Man, aged 56 years. *Diagnosis:* Old dislocation of the humerus. *Duration:* Nine months. *Movements*, etc.: There was inability to rotate the arm, loss of motion, and semiflexion of the digits due to paresis. *Operation:* After an unsuccessful attempt at reduction an incision was made through the integument covering the coracoid process and glenoid cavity. Hemorrhage was controlled and the muscles were sectioned until the osseous structures were reached. *Difficulties and complications of the operation*: An attempt was made to limit the operation to the outside of the long head of the biceps tendon, but was unsuccessful owing to anatomical difficulties. On opening the capsule the glenoid cavity was found filled with newly formed connective tissue, which was removed. The coracoid process was then broken to give space for reduction. The head of the humerus was found diseased, making removal necessary a little below the anatomical neck. The end of the humerus was then inserted into the glenoid cavity and a drainage-tube inserted. Wound now closed with silk sutures. An antiseptic dressing was put on with a plaster cast covering the shoulder and chest. *Result immediate:* Primary union of wound; paralysis disappeared. *Result remote:* The function of the joint was restored and the patient went home with a fairly useful arm. *Remarks ?.*

CASE LXIII. *1889. Bardeleben.*[205] I. D. O. forward (subcoracoid), anterior incision, resection, result good.

Man, aged 19 years. *Diagnosis:* Luxation präglenoidalis. *Duration:* Eight and a half weeks. *Movements*, etc.: Arthritis, periarthritis. *Operation:* Resection of head. *Complications of the operation:* Shoulder joint surrounded by a quantity of pus; some granulations on the articular surface of the scapula removed. Long biceps tendon could not be found in joint. The head of the humerus was much eroded on the side corresponding to the coracoid process and fixed to the anterior edge of the glenoid cavity; at this point there was a deep notch at the anatomical neck. No tuberculous foci found. At the left of the smaller tubercle in the head of the humerus was a hole the size of a bean, probably due to the pressure of the coracoid process. These changes were due to an arthritis and periarthritis following the old luxation. *Complications after the operation:* Suppuration. *Result immediate:* Wound healed slowly, three and a half months. *Result remote:* Some months later there was good movement in the shoulder-joint, both backward and forward, less upward and outward. *Remarks ?.*

CASE LXIV. *1889–90. Kocher, No. 2.*[206] I. D. O. forward (intracoracoid), with fracture of anatomical neck and of greater tuberosity, anterior incision, resection, result good.

Man, aged 52 years. *Diagnosis:* Inveterate intracoracoid subscapular luxation of shoulder. *Duration:* Seven weeks. *Movements,* etc.: Active ones only with the shoulder-blade. Rotation easy. *Operation:* Incision through deltoid, and resection of head of the humerus. *Difficulties and complications of the operation:* There was a fracture of the anatomical neck, and the greater tubercle had been torn off. Subscapular muscle much torn; coraco-brachialis and short head of biceps found torn, and during operation completely broken through. Upper end of humerus rounded off. *Complications after the operation:* None. *Result immediate:* Wound completely healed in three weeks. *Result remote:* Three weeks after operation good active motion. *Remarks:* Attempt at reduction made four weeks after injury; two weeks later a second attempt, when humerus was fractured and a large extravasation occurred, followed by pain.

CASE LXV. *1889–90. Kocher, No. 3.*[207] I. D. O. forward (subcoracoid), fracture of anterior edge of the glenoid cavity, anterior incision, resection of head, sepsis, death.

Man, aged 69 years. *Diagnosis:* Subcoracoid luxation of left shoulder. *Duration:* One month and twenty-three days. *Movements,* etc.: Active ones very limited, only possible with help of the shoulder-blade; passive ones fair, abduction 20°, adduction 20°, elevation 30°, rotation limited. Pain and blue discoloration of the arm. *Operation:* Incision along the inner edge of deltoid muscle, capsule extensively incised. Partial resection of upper end of the humerus, and also of interposed portion of remains of the capsule on the anterior edge of glenoid cavity. *Difficulties and complications of the operation:* There was an old fracture of the anterior edge of the glenoid cavity; capsule in neighborhood of head had been torn off in attempts at reduction, had become interposed between the head and cavity. There was no tear seen in the capsule. *Complications after the operation:* Severe suppuration. *Result immediate:* Patient died of sepsis sixteen days after the operation, at a time when there were many cases of infection in the clinic. *Remarks:* No attempt made at reduction until one month after the accident, when it failed, second failure two days before the operation.

CASE LXVI. *1889–90. Kocher, No. 4.*[208] I. D. O. forward (subcoracoid), recent fracture in reducing, anterior incision, also old fracture of greater tuberosity, resection, result fair.

Man, aged 56 years. *Diagnosis:* Subcoracoid luxation of right shoulder. *Duration:* Two weeks. *Movements*, etc.: Active ones only possible with shoulder-blade. Passive abduction up to 35°. Rotation slight, with crepitation. Muscles atrophied. Diminished sensibility in distribution of ulnar nerve, also some in distribution of median. Separation of fingers impossible. Hand held in position similar to that following paralysis of ulnar. *Operation:* Incision along the anterior edge of the deltoid; resection of the head. *Difficulties and complications of the operation:* Old fracture of greater tubercle, and head of the humerus is fractured, fracture line passing through the greater tubercle also. Drainage and corrosive dressing. *Complications after the operation:* None. *Result immediate:* Wound healed slowly, closed one month after operation. *Result remote:* No active movements in shoulder-joint when discharged. *Remarks:* No attempt at reduction until patient came to hospital; then one was made, and the humerus was fractured.

CASE LXVII. *1889–90. Kocher, No. 5.*[209] I. D. O. forward (subcoracoid), anterior incision, recent fracture of head and tuberosities, during manipulation, removal of the fractured head and resection, improved; the fractures were healed, but refractured in the manipulation.

Male, aged 35 years. *Diagnosis:* Subcoracoid luxation at right shoulder. *Duration:* Three months and six days. *Movements*, etc.: Passive ones tolerably limited; active ones impossible, atrophy of muscles; elbow- and finger-joints free. *Operation:* Incision over middle of upper arm between the shoulder-joint and coracoid process through the fibres of the deltoid muscle. Resection of head. *Difficulties and complications of the operation:* Double fracture of the upper end of humerus found, one through the anatomical neck, by which a deep depression was formed, in which tendon of biceps was firmly imbedded; a second fracture lying medianly to the first, and running along with it outward, by which a portion of the tubercle was broken off. The fractures were healed, but refractured in the manipulations. Capsule at one spot for a distance of one centimetre was firmly clasped in between the head and the cavity. The fractured bone was entirely removed, and the second fracture was rounded off and formed into a head, whose convexity pointed upward. *Complications after the operation:* Suppuration. *Result immediate:* Wound healed slowly. *Result remote:* On discharge, one month after the operation, there was little active motion in the arm; passive motion was good; muscles atrophied, especially the deltoid. *Remarks:* None.

CASE LXVIII. *1889-90. Kocher, No. 6.*[210] I. D. O. forward (subcoracoid), anterior incision, old fracture of greater tuberosity, resection, result fair.

Man, aged 57 years. *Diagnosis:* Subcoracoid dislocation of left shoulder. *Duration:* Four months and fourteen days. *Movements*, etc.: Stabbing pain and pressure in left axilla. No active motions possible without movement of shoulder-blade, abduction to 45°. Movements of elbow, wrist and fingers normal. *Operation:* Long incision down to head of humerus through deltoid; removal of the fractured greater tubercle, and the deformed coracoid process; resection of the upper end of the humerus. *Difficulties and complications of the operation:* Due to fragment of bone (fractured great tubercle), found between the head and cavity; and also due to the deltoid, which had become stiff and very tense. *Complications after the operation:* Suppuration, fever, formation of abscess, with severe pains following the radial nerve into the forearm. Incision of abscess and drainage. *Result immediate:* Slow healing of wound. *Result remote:* Two years after operation arm in good position. Elevation to 60°, under strong contraction of the deltoid. Abduction slight. Elevation backward, better. Passive rotation in shoulder-joint 30°, 40°. Passively arm can be raised perpendicularly, and when let down can be held actively almost in a horizontal line. *Remarks:* Dislocation at first mistaken for fracture; three weeks after accident attempts at reposition failed. A week before operation attempt failed again.

CASE LXIX. *1899-90. Kocher, No. 8.*[211] I. D. O. forward (subcoracoid), anterior incision; and old fracture of greater tuberosity, resection, result good.

Female, aged 19 years. *Diagnosis:* Subcoracoid dislocation of right shoulder. *Duration:* Eleven months. *Movements*, etc.: Only possible with the shoulder-blade abduction to 45°. *Operation:* Resection of the humerus because of severe disturbance of function. Biceps tendon saved. Drainage and irrigation. *Difficulties and complications of the operation:* Tolerably numerous fibrous adhesions over cartilage surface. Pieces of bone in the posterior wall of the capsule. The greater tubercle, which had evidently been fractured earlier, was firmly united to the head of the humerus. *Complications after the operation:* None. *Result immediate:* Wound healed normally. *Result remote:* On discharge, five weeks after the operation, movements much limited, but stronger than before. Pain only on free movements. Scapula moves with the arm. Two months later patient can

only sew and knit. Can raise arm actively to an angle of 25°. Passively all movements are possible and painless for about 45°. *Remarks:* Unsuccessful attempt made at reduction five weeks after injury; five months after accident arm reduced by Kocher's bloodless method.

CASE LXX. *1890. Robson.*[212] I. D. O. forward (subcoracoid), anterior incision, old fracture of greater tuberosity, resection, improved.

Man, aged 16 years. *Diagnosis:* Subcoracoid dislocation of the shoulder. *Duration:* Six weeks. *Movements,* etc.: Not stated. *Operation:* Vertical incision four inches and a half. *Difficulties and complications of the operation:* In addition to dislocation, found a longitudinal fracture separating the greater tuberosity from the shaft, and extending down the bone some distance beyond the line of incision; resection; reduction could not be effected on account of the glenoid cavity being filled with callus and plastic material thrown out around the fracture; resection. *Complications after the operation: ? Result immediate:* Healing in nine days. *Result remote:* Good range of movement in arm; intends resuming his work in a short time. *Remarks ?.*

CASE LXXI. *1890. Hinsel (Heinrich).*[213] I. D. O. forward (intracoracoid), anterior incision, resection; result fair.

Man, aged 36 years. *Diagnosis:* Intracoracoid dislocation. *Duration:* Nine months. *Movements,* etc: Sensation of formication in the forearm. *Operation:* Incision (?), resection. *Complications after the operation: ? Result immediate:* Healing in twelve week. *Result remote:* Motions pretty good, nervous phenomena have disappeared entirely. *Remarks ?.*

CASE LXXII. *1890. Phelps (Charles).*[214] I. D. O. forward (subcoracoid), anterior incision, resection; result good.

Man, aged ? years. *Diagnosis:* Subcoracoid dislocation. *Duration: ? Movements,* etc.: ? *Operation:* Incision (?), resection of the head. *Difficulties and complications of the operation: ? Complications after the operation:* Suppuration lasting for weeks. *Result immediate:* Sinuses persisted. *Result remote: ? Remarks ?.*

CASE LXXIII. *1891. Wolfler No. 2,*[215] from Smital. I. D. O. forward (intracoracoid), anterior incision, resection; result good.

Man, aged 26 years. *Diagnosis:* Intracoracoid dislocation. *Duration:* Nine months. *Movements,* etc., of right arm tolerably free, but did not suffice for occupation of patient (farrier). The right arm, when the body was held comparatively still, could, by help of movement of shoulder-blade, be raised forward and outward to a horizontal

line. Elbow-joint almost normal, though it could not be fully extended. Dorsal flexion, abduction and adduction of the hand are somewhat difficult. There is itching in entire forearm and at times shooting pains through the whole upper extremity. Writing is impossible. Muscles of the shoulder somewhat atrophied. Acromial portion of deltoid muscle does not react at all to electric current, the clavicular portion reacts weakly. *Operation:* Slightly convexed incision twenty centimetres long, between the deltoid and pectoralis region; the pectoralis minor, which was partially torn by the head of the humerus, was incised, the thickened wall of the capsule was cut through, the biceps tendon was laid bare (at one point it was partially cut through and later united again), and the head was resected. The old cavity was filled up with arthritis deposit and scar tissue; there was no appreciable capsule or cavity; it was cleaned out with knife and spoon. Arm put up in position of abduction, the wound cavity, especially the new glenoid cavity, was filled with sublimate gauze, and iodoform gauze enclosed therein; drainage at lower end of wound, provisionary stitches, iodoform bandage, and over this a Desault bandage. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* The curve of shoulder not quite round, the acromion projects, since the acromial portion of the deltoid muscle has remained atrophied, and the clavicular portion is markedly hypertrophied; and the pectoralis major has again developed markedly. The scar is firm. The musculature of the upper and lower arm is as strong as the left. Patient can write as well as he did before the accident. Pain and other nervous symptoms have entirely left. Movements of the shoulder-joint reached forward well to a horizontal line, also in the side; movements backward as good as on the left side, in which position the patient can hold his arm fixed. The patient lacks this power of fixation only in elevation complete, and elevation is possible with a slight swing. But even this condition, this slight dangling of the joint, will surely improve.

Case LXXIV. *1891. Thornburn.*[216] I. D. O. forward (subclavicular), anterior incision, old fracture of greater tuberosity, resection; result good.

Male, aged 15 years. *Diagnosis:* Subclavicular dislocation. *Duration:* Three months. *Movements*, etc.: Only movements which could be effected were those of the scapula, and these were slight; limb almost useless. *Operation:* Incision about four inches in length in

front of the upper end of humerus and rather to the outer side of its axis; the end of the shaft being rounded off a little, the reflected periosteum was drawn over it and secured by two catgut sutures; drainage-tube through the shoulder, an opening made behind the deltoid. Pad placed in the axilla and arm brought to the side so that the upper end of the humerus should be in contact with the glenoid cavity. *Difficulties and complications of the operation:* Upper end of the humerus found to consist of an irregular mass of bone, very soft, vascular, and evidently in part of new formation, without any trace of articular cartilage; a bony fragment about twice the size of a hazel-nut, and corresponding apparently to the greater tuberosity, was found detached and lying posteriorly. Humerus was projected from the wound and sawn across as nearly as could be judged in the position of the surgical neck; the isolated fragment of bone was also removed. No difficulty was experienced in now placing the end of the shaft into the glenoid cavity. The parts were very vascular, as was the end of the bone, and a number of small vessels were ligated. *Complications after the operation:* None. *Result immediate:* Wound healed satisfactorily and patient dismissed in less than three weeks, at which time passive movements could be made freely and painlessly performed. *Result remote:* Eleven months later, patient is earning his living as a clerk. Arm is two inches shorter than the other, and can use it for almost any purpose. The only movement which is limited is that of elevation in the abducted position; he cannot raise the humerus quite to the horizontal. Rotation of humerus is fairly well performed. *Remarks:* None.

CASE LXXV. *1891. Gwyer.*[217] I. D. O. forward (intracoracoid), anterior incision, old fracture of greater tuberosity, resection, result good.

Woman, aged 51 years. *Diagnosis:* Intracoracoid dislocation. *Duration:* Two months. *Movements*, etc.: Motion in the joint almost negative, forward and backward movements being limited to about ten degrees; abduction possible to about four inches from the trunk; rotation entirely absent. Paralysis and some atrophy of the deltoid and slight atrophy of the muscles of the hand, with loss of usefulness of the hand and of the entire extremity; continuous and increasing pain in the whole limb. *Operation:* Incision from the top of the coracoid process to about the level of the attachment of the deltoid. *Difficulties and complications of the operation:* On reaching the deeper parts nothing was found to guide, striking a region of newly formed

connective tissue extending over the whole area; head of the bone deeply imbedded in fibrous tissue lying close under the clavicle to the inner side of the coracoid process and resting on the ribs; the greater tuberosity had been broken off, but remained connected to the head by fibrous tissue; removal of the tuberosity and attempt to free the head sufficiently to raise it out of the wound; this could not be done, so the shaft was freed just below the surgical (?) neck and the bone divided with a chain saw; the neck was then grasped with strong forceps, and after a good deal of hard work with a periosteal elevator, the knife being used sparingly, the head was finally freed and removed; there existed a large cavity where the head had rested; the glenoid cavity was found filled with fibrous tissue. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Six weeks after the operation only limited amount of voluntary motion; passive motion limited and accompanied by great pain; deltoid paralysis persistent. Four months after operation abduction possible to ten inches from the trunk; rotation slight, forward and backward movements quite marked; no more pain; ability to raise the hand to the forehead and pass it behind the back; can use her hand in dressing herself and in eating and drinking, which she could not do at all before; can perform ordinary housework, such as sweeping, carrying water, etc., without the least inconvenience. *Remarks:* None.

Case LXXVI. *1893. Owen, No. 1.*[218] I. D. O. forward (subglenoid), anterior incision, resection, result improved.

Female, aged (?). She says her age is 42. Author thinks she has omitted to reckon something more than a decade. *Diagnosis:* Subglenoid luxation. *Duration:* Two months. *Movements*, etc.: Not stated. *Operation:* A four-inch incision descending from beneath the clavicle midway between the acromion and coracoid processes; the incision passed a little to the outer side of the groove between the pectoralis major and the deltoid, so as to avoid wounding the cephalic vein; it traversed the anterior fibres of the deltoid. The capsule of the joint having been opened, and the tendon of the origin of the long head of biceps having been lifted out of its bed, the arm was rolled outward and the subscapularis detached from the lesser tuberosity. It was then rolled inward, and the supra- and infraspinatus and the teres minor were detached from the greater tuberosity. Then the end of the bone was thrust through the wound, freed from all attachments behind, and sawn off with a wide oblong saw, close below the tuber-

osities. The wound was closed by a deep continuous suture, except at the lowest point, where a drainage-tube was left for twenty-four hours. *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate:* Wound healed promptly and practically without suppuration. *Result remote:* Patient much more comfortable since operation, lost all pain in the arm, and beginning to use the arm with ease and success. *Remarks ?.*

CASE LXXVII. *1893. Owen, No. 3.*[219] I. D. O. forward (subcoracoid), anterior incision, old fracture of head and removal, resection of tuberosities, result good.

Female, aged 40 years. *Diagnosis:* Fracture with dislocation, arm stiff and painful; there was much thickening about the head of the humerus, which could be felt in the arm-pit. There was anæsthesia of the left hand. Wrist and fingers absolutely stiff, and about one-third of an inch shortening. *Duration: ? Movements*, etc.:? *Operation:* Incision was made through the anterior fibres of the deltoid, and the articular surface of the head of the bone was found in the subcoracoid region. There was a complete fracture through the anatomical neck, with some comminution of the tuberosities. *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate:* Wound promptly healed, and, by massage and manipulations, she has recovered not a llttle use of the arm. *Result remote:* She can get her hand to the back of her head, and is able to use her fingers. *Remarks ?.*

CASE LXXVIII. *1893. Mac Cormac.*[220] I. D. O. forward (intracoracoid), anterior incision, resection, result fair.

Man, aged (?) years. *Diagnosis:* Intracoracoid. *Duration:* Eighteen months. *Movements*, etc.: Arm atrophied and useless, great and continuous pains. *Operation:* Anterior incision (?), resection of head. *Difficulties and complications of the operation:* Glenoid cavity obliterated, so that reduction is impossible. *Complications after the operation: ? Result immediate: ? Result remote:* Pain disappeared and arm became pretty useful. *Remarks ?.*

CASE LXXIX. *1893. Delbet (Pierre.)*[221] I. D. O. forward (subcoracoid), incision posterior, then anterior, resection, result good.

Man, aged 33 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Six weeks. *Movements*, etc.: Limb immobile, voluntary movements nul; passive movements very limited; arm can be flexed and extended for a few degrees, but abduction and rotation without movement of the scapula impossible; shoulder muscles noticeably atrophied;

no signs of compression. *Operation:* Incision two centimetres long behind, along the posterior border of the deltoid; this muscle is raised, and there appears a mass of fibrous tissue, thick and resistant, which masks completely the cup and neck of the humerus; removal of all this tissue that can be reached from behind. *Difficulties and complications of the operation:* Impossible to reduce or even loosen the head, and it is impossible to pry the head into the posterior orifice; abandonment of the posterior course. Incision in front in interpectoro-deltoid; a layer of fibrous tissue two millimetres in thickness has to be traversed before reaching the cartilage of the head; incision of all the tissue around the neck; the head is seen then, and without any deformity; impossible to reduce in spite of all efforts; resection of the head with the gouge, then with the saw through the anatomical neck. Suture of the two wounds without drainage. *Complications after the operation:* None. *Result immediate:* Primary union; on the eighth day passive movements begun; after the fifteenth day passive movements, massage, electricity, were kept up regularly. *Result remote:* Two months after the operation the patient can easily place his hand on the shoulder and on the head; movements of flexion and extension are normal, rotation inward limited; abduction (the scapula being fixed) also limited; rotation externally almost nul. Five months later the conformation of the shoulder is normal; the upper extremity of the humerus is under the acromion, but is slightly enlarged; the arm is strong and permits of hard work, but the mobility is rather diminished than increased. Active movements; flexion and extension (*i. e.*, movements of elevation forward and backward) can be made to the horizontal; abduction without participation of the scapula permits the elbow to be carried to nineteen centimetres from the trunk; the hand is easily carried upon the sound shoulder and on the buttock of the opposite side; it is carried to the top of the head with some little effort; it can be carried to the nucha, but with difficulty, by bending the head very much. Passive movements; flexion, extension and reduction are no more extensive than in the active movements; rotation inward measures but a few degrees, and is accompanied by crackling; external rotation is nul. The patient can do his work (butcher) so well that his companions had never noticed anything peculiar. *Remarks:* The result would have been still better if at one time the regular treatment had not been suspended and the arm placed in a sling for awhile.

CASE LXXX. *1894. Porter (Charles B.).*[222] I. D. O. simple, forward

(subcoracoid) V-shaped incision, resection difficult; some secondary hemorrhage, necrosis of bone, result improved.

Man, aged 72 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Seven and a half months. *Movements*, etc.: Great atrophy of the deltoid, scapula moves with the humerus; patient can raise elbow but a short distance from side; cannot put hand behind his back; complains of pain and a queer sensation in the hand. *Operation*; V-shaped incision, carried down to the bone; on feeling at the internal superior angle of the wound, the coracoid process was found and dissected with a blunt instrument. *Difficulties and complications of the operation:* Head of the humerus firmly bound down, immovable; glenoid cavity entirely filled up; bone sawed below the head, upper fragment then grasped with the lion-jawed forceps; manipulation in all directions, and dissection by a blunt dissector; finally, it is pried and twisted out of position; in doing so several bits of bone were torn off from it; general oozing. *Complications after the operation:* Oozing for thirty-six hours. *Result immediate:* Suppuration. *Result remote:* Long suppuration; small spiculæ of bone removed; discharged improved, fistula still remaining. *Remarks ?.*

CASE LXXXI. *1894. Wyeth (J. A.).*[223] I. D. O. forward (subcoracoid), anterior incision, resection, result good.

Man, aged about 50 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Four years. *Movements*, etc.: *?* *Operation:* Incision, (?) resection. *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate:* Recovery. *Result remote:* Has been doing nicely. *Remarks ?.*

CASE LXXXII. *1895. Monks (G. H.).*[224] I. D. O. forward (subcoracoid), anterior incision, resection, improved.

Man, aged 59 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Ten months. *Movements*, etc.: Atrophy of all the muscles of the shoulder-joint, as well of the arm and hand; patient's grasp very weak; voluntary movements very limited; condition of the nerves determined by Dr. Prince, neurologist of Boston City Hospital, reveals complete ulnar paralysis and partial paralysis of the median, musculo-spiral, and circumflex nerves; the man declares his arm is practically useless and that daily he seems to be losing power in it. *Operation:* Incision at the anterior margin of the deltoid; division of the supraspinous, infraspinous, small round, and subscapular; the long tendon of the biceps was dislocated from its groove, but not divided; head of humerus very much atrophied; on being removed it

could be easily crushed by the bone forceps, showing that had an attempt been made to reduce the dislocation by manipulation, a fracture would have taken place at the neck of the bone. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* A sufficient time had not elapsed when the patient left the hospital to enable to state how much the patient gained in the use of his limb; thus far the man has a wider range of motion of the arm and can use his hand better; condition of the nerves also much improved. *Remarks:* At the time of the accident the dislocation was reduced, but that same night the head of the bone dropped out of the socket again; the next day it was again put back, but dropped out again soon after.

CASE LXXXIII. *1895. Lejars, No. 1.*[225] I. D. O. forward (subcoracoid), anterior incision, old fractured head, resection, *i. e.*, removal, death.

Female, aged 57 years. *Diagnosis:* Irreducible subcoracoid luxation of left shoulder, complicated by fracture of the anatomical neck and displacement of the head of the humerus into the axilla. *Duration:* Two and a half months. *Movements*, etc.: Complete loss of power, and marked atrophy of the deltoid. *Operation:* Anterior incision, ligature and section of cephalic vein outward of the coracobiceps; dissection little by little, from without inward, of the vascular nerve bundle which lay immediately in front of head of humerus, adherent to it, and stretched; finally broken head of humerus is freed, the humerus minus the head, after being trimmed with the scissors, is replaced in the glenoid cavity; through a complementary posterior incision behind the anterior edge of the axilla the head is removed. *Difficulties and complications of the operation:* The separated head, dislocated forward and downward was entirely concealed by the vasculonervous plexus, and was only united to the shaft by a few fibrous strands and some osseous stalactites, which were destroyed without difficulty, but its relations were so intimate with the vessels and nerves that instead of making a dangerous attempt to free it from in front, it was removed by the posterior incision. *Complications after the operation:* None. *Result immediate:* Supposedly primary union. *Result remote:* Death in six days from pneumonia. *Remarks ?.*

CASE LXXXIV. *1895. Lejars, No. 2.*[226] I. D. O. forward (subcoracoid), anterior incision, resection, result not stated.

Male, age ?. *Diagnosis: ? Duration:* One year. *Movements*, etc.: Deltoid atrophied, abduction and rotation of arm impossible. *Opera-*

tion: Long anterior incision at the edge of the pectoro-deltoid fold; cephalic vein ligated and cut; then separating and cutting the muscles and capsules, the luxated head was finally removed. *Difficulties and complications of the operation:* The head was held down posteriorly, and was entirely surrounded by a cicatricial fibrous tissue, which completely enveloped it, and descended down around the neck, covered both tuberosities, and involved the glenoid cavity, which was completely masked by a compact and woven mass. The lesser pectoral muscle was sclerosed and retracted, and circled the neck of the humerus like a bridle and prevented all isolation of the head. The muscle had to be cut through. The glenoid cavity had to be freed of the fibrous mass which filled it, and was found rough, without cartilage and cracked. *Complications after the operation:* ? *Result immediate:* ? *Result remote:* ? *Remarks:* This is all that is to be said about the case. The author simply mentions it in talking of his other case, and it is not given in full.

CASE LXXXV. *1895. Bickham and Souchon.*[227] I. D. O. forward (subcoracoid), anterior incision, resection, improved.

Man, aged 32 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Nine months. *Movements,* etc.: Muscles of whole of upper limb considerably atrophied, all movements very limited. *Operation:* Incision near the anterior edge of deltoid through an old scar which resulted from an attempt made about six months previously to resect the head; the head was found to be so deep and so firmly bound down that the operation was then abandoned. *Difficulties and complications of the operation:* Very strong adhesions bound circumference of the head to the surrounding parts; also the cartilaginous surface gives insertions to these fibrous bands; the head is so fixed that rotation to any extent is impossible; after much trouble the dissection, proceeding from behind forward (toward the large vessels in front) struck a portion of the surface of the head which was free from adhesions; this portion was about as large as a silver quarter; thence the balance of the detachment was comparatively easy; kept close to the bone all the time, specially when operating on the front part of the head; the head much enlarged, about one-fourth more than its normal size; a portion of it had to be chiselled off to make room to penetrate more deeply; it is very hard; horizontal section with the saw on a line with the lower margin of the head; drainage-tubes. *Complications after the operation:* Although great care had been taken to stop all bleeding, yet the patient presented secondary hemorrhage a few

hours later; had to be transfused; suppuration. *Result remote:* Resected extremity became fixed in its new position near the cup in spite of treatment; however, it may be that not enough of the bone had been resected, and that the passive movements had not been begun early enough. However, patient enjoys a greater range of motion than before, but the scapula moves with the humerus. Can eat with his hand. Muscles remain atrophied. Improvement continues. *Remarks:* It is probable that the previous attempt, which had been followed by suppuration, was the cause of the extent and toughness of the adhesions; also of the hypertrophied condition of the head.

CASE LXXXVI. *1895. Schmittle (Julius F.).*[228] I. D. O forward (subcoracoid), anterior incision, resection, result good.

Woman, aged 45 years. *Diagnosis:* Subcoracoid *dislocation. Duration:* Twenty-six months. *Movements*, etc.: Movements very limited; arm atrophied. *Operation:* Vertical incision from acromion process down about three inches in length; muscles about the head removed, together with periosteum; bone sawn through at the surgical neck. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union; the wound was not dressed for fifteen days after the operation. *Result remote:* At the end of a month she was told to make use of her arm, which she did with celerity. Three months after the operation she had good use of her arm; there was, however, some impediment to external and internal rotation. *Remarks:* None.

CASE LXXXVII. *1896. Boone (W. H.).*[229] I. D. O. forward (subcoracoid), anterior incision, resection, result good.

Male, aged 22 years. Chinaman. *Diagnosis:* Subcoracoid dislocation, head prominent beneath the subcoracoid. *Duration:* Forty days. *Movements*, etc.: Cannot move his arm at all, severe pain. *Operation:* Incision through the deltoid muscle to the capsule and periosteum, drew aside the margins of the wound with retractors, and opened into the joint; excised head. *Difficulties and complications of the operation:* Firm adhesions; more than ordinarily difficult; head of bone remaining fixed, even when freed from the ligaments and muscular insertions; head of bone was thrust out of the wound and removed at the anatomical neck by a narrow-back saw passed behind it; there was no difficulty in getting the bone in place, drainage-tube inserted, iodoform dressings applied, the arm retained upon a triangular cushion; wound sutured with catgut. *Complications after the operation:* None. *Result immediate:* Wound healed in ten days. *Result remote:* Four

weeks after admission has free motion of shoulder; can put his hand on his head; able to earn his living. *Remarks ?.*

CASE LXXXVIII. *1896. Bremken.*[230] I. D. O. forward (intracoracoid), interior incision, resection, result good.

Female, aged 50 years. *Diagnosis:* Intracoracoid, we might also say subclavicular luxation of right shoulder. *Duration:* Six months. *Movements*, etc.: All very much limited on account of severe pain. *Operation:* Antero-internal incision, avoiding terminal ends of circumflex nerve. Head exposed and capsule freely incised. Head resected, glenoid cavity freed of fibrous tissue. Wound sewed up; small drain. *Difficuties and complications of the operation:* Old glenoid cavity much reduced and modified; instead of being concave it was flat, and surface was so reduced in size that it did not admit end of humerus, even after head was resected. A new cavity was formed in the shoulder-blade, below the old glenoid cavity, sufficiently large to hold the humeral epiphysis perfectly. *Complications after the operation:* None. *Result immediate:* Wound completely healed six days after operation. *Result remote:* Nine months after the operation patient could wash, sweep, scrub, pump, raise heavy weights and move furniture. Pain had ceased immediately after operation. She could use her right arm almost as well as left, and strength of both seemed equal. *Remarks:* The shoulder was so swollen at time of accident that no attempt at reduction was made until a week later, when it failed. Other unsuccessful attempts also made.

CASE LXXXIX. *1896. Chénieux.*[231] I. D. O. forward (intracoracoid), anterior incision, resection, result good.

Male, aged 20 years. *Diagnosis:* Intracoracoid luxation of right shoulder. *Duration:* Thirteen months. *Movements*, etc.: Could not raise his hand above face. Internal and external rotation practically lost, could not bring forearm backward. *Operation:* Resection of head. *Difficulties and complications of the operation:* Due to the fact that the head was firmly held down by adhesion; and that tendon of subscapular muscle had to be cut through in order to free head. The tendons of the supra- and subspinous muscles and the small round tendon had been broken, and had no connection with the greater tuberosity. There was a large amount of cicatricial tissue, remnant of the capsule, which occupied the glenoid cavity and subacromial space, which had to be cut away. *Complications after the operation:* None, no suppuration. *Result immediate:* ? *Result remote:* Hand

could be carried to top of head one month after operation. *Remarks:* Both shoulders had been dislocated as a result of a nocturnal epileptic attack. Luxations had not been recognized, and apparently no attempts at reduction had been made.

CASE XC. *1896. Erdmann (John).*[232] I. D. O. forward (subcoracoid), anterior incision, old fracture of head; refractured head chiselled off, resection, result good.

Man, aged 44 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Ten months. *Movements,* etc.: Marked emaciation of the upper half of the trunk, flattening of the shoulders; prominence within one inch under surface of the clavicle; large and round mass beneath the coracoid; evidence of some bony substance filling the glenoid cavity, A diagnosis of fracture of the head of the humerus with dislocation and possible fracture of coracoid process. While manipulating the arm, after anæsthesia, a distinct snap was heard, the arm became freely mobile, with crepitation. *Operation:* Incision and resection. *Difficulties and complications of the operation:* A mass of callus was found on the site of the greater tuberosity and anteriorly into the glenoid fossæ, while internally and beneath the coracoid process the head of the bone was found; these two portions were separated by a fissure from which there was free oozing; the fissure accounted for the snapping heard during the manipulation, and was a fracture of the head from the side of the shaft where it had become attached by callus. Head of the humerus chiselled out. The anterior half of the glenoid cavity had been broken and was solidly united with the head of the humerus. Long head of the biceps was imbedded in a mass of callus on the humeral head, and by pressure had been atrophied to one-half its size at other points. The callus upon the greater tuberosity was removed with a saw. Sutures, etc. *Complications after the operation:* ? *Result immediate:* Twenty days after, drainage removed and passive movements begun. *Result remote:* Three months after the operation the patient could abduct the arm to 45°, could place the hand on the opposite shoulder, forward and backward motion was good, rotation slight. Functions of the elbow, wrist, and fingers were excellent. *Remarks* ?.

CASE XCI. *1897. Vander Veer.*[233] I. D. O. forward (subcoracoid), with fracture of the surgical neck, refracture in trying to reduce; operation immediate; anterior incision, resection of upper fragment; hemorrhage during operation; amputation at shoulder; death on second day from exhaustion.

Woman, aged 63 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Three and a half months. *Movements*, etc.: Great pain, atrophy of muscles of limb. *Operation:* After attempt had been made to reduce by Kocher's method and by the heel process it was discovered that the humerus was fractured; patient was operated on immediately; incision made to the inner side of the glenoid cavity from the coracoid process down to the point below the surgical neck. *Difficulties and complications of the operation:* As soon as fractured ends were exposed venous hemorrhage became very profuse, and was not easily controlled; upper shaft (fragment) of humerus removed with chain saw; bone soft, indicating that there had not been perfect union; capsule of joint opened into and bone rolled out from underneath the coracoid process; arterial hemorrhage became very profuse; the subclavian was controlled, but hemorrhage was from so many points that, together with recognized impaired nerve-supply to arm and forearm, and in consideration of her time of life, it was believed best not to attempt ligation of subclavian, feeling that gangrene of arm and death would surely follow. It was decided to do a shoulder-joint amputation. This was done as quickly as possible; vessels ligated with silk; also all bleeding-points, of which there were a great many. Axillary nerves were all matted together by adhesive inflammation and was hard to recognize. *Complications after the operation:* Little oozing; patient gradually became weaker, and died of exhaustion at the end of twenty hours. *Remarks ?.*

HISTORIES OF I. D. O. FORWARD TREATED THROUGH AN AXILLARY INCISION BY REDUCTION.

CASE XCII. *1889–90. Kocher.*[234] I. D. O. forward (intracoracoid), fracture of greater tuberosity, axillary incision, reduction, later resection; improved.

Male, aged 58 years. *Diagnosis:* Luxation of right shoulder, subscapular (intracoracoid). *Duration:* Five weeks. *Movements*, etc.: Active ones almost impossible. Arm readily movable on passive motion, but it cannot be brought close to body. *Operation:* Incision into axilla behind vessels and nerves parallel with them, reduction impossible; resection of greater tubercle followed by reduction of head. *Difficulties and complications of the operation:* Capsule much thickened. The greater tubercle, which was broken off, was adherent to the tendons of the supra- and infraspinatus muscles, and was pressed against

the glenoid cavity by the tense capsule, the posterior portion of which was drawn forward. *Complications after the operation:* Suppuration. *Result immediate:* Slow granulation of wound; resection of head. *Result remote:* Seven months after the operation there was almost complete anchylosis of the shoulder. Slight movement possible. Elbow cannot be fully extended. Flexion free; cannot close hand fully. Eleven months after operation, complete fibrous anchylosis of shoulder. Marked atrophy of deltoid. Discharging fistula at site of old operation; patient died five years later, insane, and fistula was still open. *Remarks ?.*

HISTORIES OF I. D. O. TREATED THROUGH AN AXILLARY INCISION BY RESECTION.

CASE XCIII. *1860. Langenbeck.*[235] I. D. O. forward (axillary), with old fracture of greater tuberosity, axillary incision, resection, result improved.

Man, aged 45 years. *Diagnosis:* Axillary dislocation of right shoulder. *Duration:* Five months. *Movements*, etc.: Evidence of pressure in the brachial plexus. *Operation:* Axillary incision; resection of head easily performed. *Difficulties and complications of the operation:* The greater tuberosity was fractured. *Complications after the operation:* None. *Result immediate:* Healing almost altogether primary. *Result remote:* At the sixth week the muscles reacted well to the induced current, but the usefulness of the limb was but little improved. *Remarks ?.*

CASE XCIV. *1873. Lister.*[236] I. D. O. forward (subcoracoid), rupture of artery during efforts to reduce before cutting, axillary incision, ligation, resection, death.

Man, aged 58 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Six weeks. *Movements*, etc.: ? *Operation:* An attempt was made at reduction by manipulation and pulleys, no very great force being used; this was unsuccessful, and the efforts at reduction were no sooner discontinued than a large swelling was noticed below and behind the axilla; no pulse at the wrist. At once cut down into the axilla and turned out a mass of clots; found nothing wrong in the lower part of the artery except absence of pulsation; then divided both pectoral muscles to the clavicle, and there discovered a rent in the artery a sixth of an inch long. Artery tied above and below the rent. Head then resected and the humerus placed in normal position. *Difficulties and*

complications of the operation: None as regards the resection. *Result immediate:* Patient rallied somewhat, but died three hours after the operation. Post-mortem examination revealed that the artery had become attached by an osteo-fibrous band to the coracoid process, on the one hand, and to the neck of the humerus, on the other, and this had been torn across during manipulation at the point of its attachment to the artery. *Remarks* ?.

CASE XCV. *1896. Spieker, No. 1.*[237] I. D. O. forward (subcoracoid), with fracture of greater tuberosity, axillary incision, resection, improved.

Man, aged 45 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Five and a half months. *Movements*, etc.: Arm could not be moved at elbow or wrist; sense of formication; arm hangs in pronation; supination can only be half carried out. Extension of fingers very slight, and in last three only at the metacarpo-phalangeal joint; separation of fingers practically impossible; the fingers are in a position of extension; the individual phalangeal joints are stiff but not ankylosed, but very painful when moved passively; there is anæsthesia in the extension and flexor surfaces of the last three fingers; sensation in arm generally diminished. *Operation:* Incision along posterior edge of the coracobrachialis muscle. After cutting through skin and axillary fascia, head free. Head resected; salicylic acid dressing without drainage. *Difficulties and complications of the operation:* Muscles had been entirely torn off from the lesser tubercle, and the greater tubercle was found separated from the head, possibly as result of attempt at reduction. *Complications after the operation:* Slight suppuration. *Result immediate:* Wound healed slowly. *Result remote:* About six weeks after operation movements in arm a little better than before operation, though muscles reacted well to electric current. *Remarks* ?.

CASE XCVI. *1876. Spieker, No. 2.*[238] I. D. O. forward (subcoracoid), dislocation, axillary incision, resection.

Man, aged 40 years. *Diagnosis;* Subcoracoid luxation. *Duration:* Five weeks. *Movements*, etc. ? *Operation:* Incision along middle of axilla parallel to long axis of humerus. Periosteum separated; head resected, antiseptic dressing without drainage. *Difficulties and complications of the operation:* The greater tubercle was found broken off. *Complications after the operation:* Extensive suppuration followed by general septicæmia. *Result:* Death three weeks after operation due to pyæmia. *Remarks:* No immediate attempt at reduction after operation made, but several made unsuccessfully before operation. As result

of last of these shoulder became much swollen and very painful and complicated with a large extravasation of blood.

CASE XCVII. *1877. Langenbeck, No. 1*[239] *(in Kronlein).* I. D. O. forward (axillary, *i. e.*, subcoracoid), with old fracture of great tuberosity, axillary incision, improved slightly.

Man, aged 45 years. *Diagnosis:* Axillary luxation. *Duration:* Five months old. *Movements*, etc.: Symptoms of pressure on brachial plexus, formication, impossibility to make movements at elbow and wrist, hand held in pronation and can with difficulty be brought into half supination. Joints of fingers stiff, but allow passive movements. Sensibility of forearm much diminished. Reaction muscles of forearm to induced currents very weak. *Operation:* Resection of head according to Langenbeck's method. *Difficulties and complications of the operation:* Great tuberosity was found broken off. *Complications after the operation:* None. *Result immediate*: Wound healed by first intention. *Result remote:* Six weeks after operation muscles react well to induction currents, but use of arm had improved but little. *Remarks:* One attempt made at reposition before operation failed.

CASE XCVIII. *1877. Langenbeck, No. 2*[240] *(in Kronlein).* I. D. O. forward (subcoracoid), axillary incision, resection, death.

Male, aged 41 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Five weeks. *Movements*, etc.: Movements in upper arm nul; neither axillary nor radial arteries could be felt to pulsate; sensibility retained in whole arm. *Operation:* Resection of head according to Langenbeck's method, axillary incision. *Difficulties and complications of the operation:* It was laborious, since the head was more deeply situated than appeared; considerable hemorrhage; ligature of many vessels, probably of scapular artery in depth of wound. *Complications after the operation:* Axillary abscess. *Result immediate*: Erysipelas. *Result remote:* Death the fourth week after operation. *Remarks*: Attempts were made at reposition without success a week before operation, and these were followed by severe local reaction, swelling, pain of shoulder and right side of chest. At autopsy there was found a gangrenous osteomyelitis of humerus and gangrenous thrombi in the course of the brachial and radial arteries and veins as far up as the axilla.

CASE XCIX. *1882. Volkmann.*[241] I. D. O. forward (subcoracoid), with fracture of lesser tuberosity, axillary incision, resection, improved.

Man, aged 55 years, very vigorous. *Diagnosis:* Subcoracoid dislocation. *Duration:* Five weeks. *Movements*, etc.: Œdema of lower

arm, crepitation felt on rotating the arm. *Operation:* Axillary incision of Langenbeck; resection. *Difficulties and complications of the operation:* Only due to injury of vein, which may have been due to attempts at reposition or to a sharp fragment of bone, the size of a phalanx, which came from the humerus at site of the lesser tubercle, and which was found in the wound, still attached to the periosteum. After the resection there was still so much obstruction from the soft tissues that it was impossible to bring the humerus into an exactly correct position. *Complications after the operation:* None. *Result immediate:* Healing by first intention. *Result remote:* The patient was discharged at the end of five weeks, with good position and good passive movements of arm. Final result unknown. *Remarks:* Three attempts at reposition were unsuccessful, these were made just before the operation.

CASE C. *1888. Nelaton.*[242] I. D.O. forward (subcoracoid), axillary incision, resection, result?

Female, aged 57 years. *Diagnosis:* Subcoracoid luxation. *Duration:* Three months. *Movements*, etc.? *Operation:* Long axillary incision was made over the displaced head; the vasculo-nerve bundle was turned upward. Incision made through the fibrous tissue which covered the head; head of humerus resected. *Difficulties and complications of the operation:* An attempt at reducing the dislocation was made, but this was impossible, because, although the glenoid cavity was free at almost all points, at one point posteriorly the capsule was stretched and retracted and withstood all attempts to distend it. In other words, the posterior portion of the articular capsule was flattened against the glenoid cavity, was thickened and did not permit itself to be sufficiently separated to allow head to be reduced. To overcome this obstacle it would have been necessary to split it crosswise; but the incision having been made in the axilla, the capsule could only be reached, with the tip of the finger, from deep in the wound, and it would have been difficult to introduce a bistoury, so resection was done. *Result immediate:* ? *Result remote:* ? *Remarks:* No further notes of the case are given.

HISTORIES OF I. D. O. AND FORWARD, TREATED THROUGH A POSTERIOR INCISION BY REDUCTION.

CASE CI. *1885. Schonborn No. 3.*[243] I. D. O. forward (subcoracoid), posterior incision, reduction, result not stated.

Man, aged 42 years. *Diagnosis:* Subcoracoid dislocation. *Dura-*

tion: Nine weeks. *Movements*, etc.: ? *Operation:* A posterior incision on the outer side of the arm through skin and deltoid, ten centimetres long; removal of the remnants of the capsular ligament. *Difficulties and complications of the operation:* After repeated attempts, reduction was effected. *Complications after the operation:* A fortnight later, when the dressings were changed, luxation occurred in an internal and anterior direction; this luxation was reduced on the following day under anæsthesia; again at the next change of dressing, evident displacement of the head once more inward and forward took place. *Result immediate:* The healing of the wound was even. *Result remote:* At the time of his discharge, six weeks later, the conditions of the functions of the limb are not mentioned: *Remarks:* During an attempt to reduce under anæsthesia, before the operation, a transverse fracture of the scapula had resulted below the spine. It was after these fragments had united that bloody reposition was undertaken.

CASE CII. *1895. Mudd (H. H.).*[442] I. D. O. forward (subcoracoid), incision posterior (Kocher's), arthrotomy, reduction, result good.

Man, aged 50 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Fourteen months. *Movements*, etc.: Could not use forearm in his work (glass-blower); no pressure symptoms, but muscular power weak. *Operation:* Joint exposed after Kocher's method of posterior resection of the shoulder-joint; capsule incised at right angles to the glenoid fossa, so as to expose the joint; absolutely no change in the glenoid fossa; small amount of mucoid tissue in the fossa; capsule of the joint thickened and apparently shortened, stretched tightly over the glenoid fossa; head of the bone could not be forced back into the socket until after the capsule was loosened, because of the shortening on the posterior surface; no adhesion of the parts outside to prevent reduction, the opening of the glenoid cavity being large enough for its entrance; replacing of the acromion in position. *Difficulties and complications of the operation:* The acromion process was with difficulty pressed back into position; sutures, etc. *Complications after the operation: ? Result immediate:* No suppuration, slight discharge for some weeks from the capsule at the site of fracture. *Result remote:* Movements and use of limb improved; when seen last, movements somewhat limited; could not lift his arm to right angle; rotary movement improved; no pain, except in limitations of movement.

HISTORIES OF CASES OF I. D. O. FORWARD, TREATED BY SUBCUTANEOUS SECTIONS AND OSTEOTOMY.

CASE CIII. *1819. Weinhold–Swanzig (C. Q.)*[245]. I. D. O. forward (intracoracoid), subcutaneous sections, reduction, result good.

Man, aged 18 years. *Diagnosis:* Intracoracoid dislocation, head under the great pectoral *Duration:* Two and a half months. *Movements*, etc.: ? *Operation:* A fold of skin having been picked up, the external portion was incised transversely to the extent of half a finger's breadth from the insertions of the great pectoral, very forcible extension being kept up. When this was accomplished the wound was increased in length to the extent of nearly a half finger's breadth; immediately the humerus approached near the glenoid cavity, and without any trouble it could be inserted into the cavity and retained in place. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Arm could be moved in all directions. *Result remote:* Three weeks later quite cured. *Remarks:* This is the case of Weinhold; patient came finally into Swanzig's hands.

CASE CIV. *1839. Diffenbach.*[246] I. D. O. forward (subcoracoid), incision of muscles, arthrotomy, reduction, result good.

Man, aged ? years. *Diagnosis:* Subclavicular dislocation; the head has ascended up to near the clavicle, within two inches of the upper extremity of the sternum. *Duration:* Two years. *Movements*, etc.: The arm is scarcely movable; by pulling the arm outward stretches the tendons of the great pectoral, great dorsal, great round, small round, which caused much pain; there was a sense of coldness in the limb; radial pulse is somewhat weaker; limb useless, only the hand could be moved a little. *Operation:* Extension practised by six assistants, with bands fixed upon the wrist; counter extension by six assistants pulling on a towel placed in the axilla to draw the humerus outward. By means of a small knife the muscles are sectioned; the great pectoral is divided near its tendon, the entered axilla and the great dorsal, the great round, and the small round successively cut; entrance made on three sides along the edge of the humerus, and subcutaneous section of the thick false ligaments surrounding the new-formed joint performed; the extension is slacked, the head is rotated repeatedly; extension is reapplied; complete reduction; the shoulder has returned to its natural condition; starch bandage. *Com-*

plications after the operation: None. *Result immediate:* Primary union. *Result remote:* Complete recovery of the movements. *Remarks ?.*

CASE CV. *1852. Simon (Gustae.)*[247] I. D. O. forward (coraco-clavicular), subcutaneous tenotomy, reduction, result good.

Female, aged 40 years. *Diagnosis:* coraco-clavicular luxation of right arm. *Duration: ? Movements,* etc.: Atrophy of muscles, great limitation in movements, only forearm could be used. *Operation:* Separation of adhesions about the head of humerus, with a tenotome on three different occasions, first cutting under chloroform, in November, and two more later, the final one on December 22d. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* After third procedure patient could raise arm above her head and carry out all movements almost as well as with sound arm. The shoulder was moulded out like the healthy one, coracoid process could be easily felt; subclavicular depression was again reproduced, and almost as broad as a sound side. Complete reduction had taken place, in spite of the fact that the doctor had never noticed head of humerus slip back. *Result remote:* The woman had been in service one month, and did as heavy work as before the accident. Movements possible in every direction; movements somewhat limited backward, and cannot be raised higher than a right angle, and backward cannot extend it so as to button waist-belt of dress. Some crepitation to be felt on passive movement in joint. Musculature of arm has increased, and arm is almost as large as left. *Remarks ?.*

CASE CVI. *1882. Polaillon.*[248] I. D. O. forward (intracoracoid), subcutaneous section, reduction, result good.

Male, aged 24 years. *Diagnosis:* Intracoracoid luxation of left shoulder. *Duration:* Four months. *Movements,* etc.: Spontaneous ones very limited. Elevation and rotation outward impossible. Passive movements no more extensive than the active. Muscles of shoulder and arm markedly atrophied. Sensation of almost continual fatigue in arm. *Operation:* First attempt was made to reduce arm by traction, but this failed, and changed the intracoracoid to a subcoracoid luxation; three days later a tenotomy was performed in the following manner: 1st. Drove a tenotome one centimetre below the apex of the acromion, and directed it horizontally from without inward until the head was reached. 2d. Drove a long-blunted tenotome between the anterior surface of the head and the deltoid, and sectioned all the fibrous tissues, cutting against the bone. 3d. The instrument was then

withdrawn slightly, and then driven behind the head, where the fibrous tissues were cut in a similar manner. 4th. This latter procedure can be repeated in other directions. (Delbet, page 149.) *Difficulties and complications of the operation:* None *Complications after the operation:* None. *Result immediate:* Wound healed by first intention. *Result remote:* Six weeks later the movements of the rotation following the axis of the arm are restored. Patient can raise hand to mouth and put it on back of head. He can raise the arm and carry it downward and backward to the lumbar region. Every day movements gain in extent. *Remarks ?.*

CASE CVII. *1886. Mollière.*[249] I. D. O. forward (subcoracoid), tenotomy, reduction, result good.

Man, aged 53 years. *Diagnosis:* Subcoracoid luxation. *Duration:* Five weeks. *Movements*, etc.: Head very firmly fixed under coracoid process. *Operation:* Tenotomy, subcutaneous, of all the cicatricial bands which filled the glenoid cavity; knife introduced through deltoid or about the middle. Head then easily reduced by rotation. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* No reaction. *Result remote:* Movements of arm completely re-established. *Remarks:* The head was firmly fixed under the coracoid process.

CASE CVIII. *1876. Mears (J. Ewing).*[250] I. D. O. forward (subcoracoid), subcutaneous, osteotomy, result fair at first, but not so good later.

Man, aged 38 years. *Diagnosis:* Arm markedly projected from side of the body and extended, elbow drawn backward, and forearm in a state midway between supination and pronation. Head of humerus was found to be fixed in its acquired position by adhesions. *Duration: ? Movements*, etc.: Patient unable to place the hand on opposite shoulder; when the arm was approximated to the side of the body could introduce hand into pantaloons-pocket by great effort, but hip-pocket could not be reached; pain. *Operation:* Subcutaneous division as practised by Mr. Adams; knife carried flatwise through the tissues, on the outer aspect of the arm, two inches below the acromion process, directly to the bone, position of the blade changed, and the periosteum divided by incisions carefully made, the edge of the knife being kept closely in contact with the bone. Knife having been withdrawn in the same manner as introduced, the saw was passed flatwise through the opening to the bone, bone divided by very short "higgling" movements, time required to sever it being five minutes.

When section was completed, the fragments were separated, the lower one being thrown backward and outward, and the arm was placed in the Velpeau position and secured by bandages. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Wound closed in three days without suppuration. *Result remote:* At the expiration of ten days the arm was released, and passive motion was instituted. Three months after operation arm hung naturally by the side, no apparent difference in length of two limbs; natural in size and contour, muscles firm, and atrophy of the deltoid in a great measure disappeared. Rotation of the arm could be performed without causing pain and without moving the upper fragment. When lower fragment was forced up and rotated, slight crepitus could be elicited. Hand could be placed on opposite shoulder, into pantaloons- and hip-pocket, watch could be taken readily from vest-pocket; patient could raise a sixteen pound weight by the pulley, at which exercise he practised daily, gradually increasing the weight. Careful examination nine months later showed the false joint which had been formed every way satisfactory. Later much stiffness and callus occurred, and the limb was not useful. *Remarks:* Efforts at reduction were made prior to operation.

HISTORIES OF I. D. O. DOWNWARD TREATED THROUGH AXILLARY INCISION BY RESECTION.

CASE CIX. *1877. Langenbeck.*[251] I. D. O. downward (axillary ?), axillary incision, resection, result (?).

Man, aged ? years. *Diagnosis:* Axillary dislocation; marked projection of the head; the artery is pressed downward and inward. *Duration:* ? *Movements*, etc.: ? *Operation:* Longitudinal incision along the inner border of the coraco-brachial, head projects through incision; resection of the head. *Difficulties and complications of the operation:* None. *Complications after the operation:* ? *Result immediate:* Wound healed on the seventeenth day. *Result remote:* ? *Remarks* ?.

CASE CX. *1879. Patterson.*[252] I. D. O. downward (subglenoid), axillary incision (?), reduction, result ?.

Man, aged 59 years. *Diagnosis:* Subglenoid (axillary). *Duration:* Eleven weeks. *Movements*, etc.: Partial paralysis; arm and hand cold and swollen. *Operation:* Incision (?), reduction not effected; resection. *Difficulties and complications of the operation:* None. *Complications after the operation*: ? *Result immediate:* ? *Result remote:* ?

CASE CXI. *1885. Thomas (of Tours).*[253] I. D. O. forward (subglenoid), axillary incision, resection, result improved.

Man, aged 45 years. *Diagnosis:* Subglenoid dislocation, axillary. *Duration:* Forty-four days. *Movements*, etc.: ? *Operation:* Incision through axilla. *Difficulties and complications of the operation:* The operation was long and tedious, great difficulty in freeing the head; it had to be sectioned by successive slices. *Complications after the operation:* Suppuration. *Result immediate:* Wound closed at the end of the second month. *Result remote:* Three months after the operation the patient had use of his hand and forearm, passive motion being possible without pain; the arm could be raised to a right angle, carried forward and backward, and some rotation was possible. Nine months after the operation, the patient having failed to use his arm according to directions, there was anchylosis of the shoulder and stiffness of the elbow, with incomplete extension of the forearm; there was also an excessive growth of bone taking the place of the head. Taking in consideration his former state, the patient was, however, satisfied. *Remarks* ?.

HISTORY OF A CASE OF I. D. O. DOWNWARD TREATED BY OSTEOCLASIA.

CASE CXII. *1879. Desprès.*[254] I. D. O. forward (subglenoid), deliberate fracture, result bad.

Woman, aged 53 years. *Diagnosis:* Subcoracoid, dislocated for the second time. *Duration:* ? *Movements*, etc. ? *Operation:* Deliberate fracture of the neck so as to be able to bring the arm close to the body. The forced elevation of the arm causing it to press against the acromio-coracoid vault, determined the fracture; a crackling sound was heard, crepitation was felt. *Difficulties and complications of the operation:* None. *Complications after the operation:* A callus formed, and it was impossible to obtain a false joint. *Result immediate:* Failure. *Result remote:* Same. *Remarks:* None.

HISTORIES OF CASES OF I. D. O. BACKWARD TREATED BY RESECTION.

CASE CXIII. *1877. Reid.*[255] I. D. O. backward (post-glenoid), in the adult, resection, improved.

Man, aged 53 years. *Diagnosis:* Posterior glenoid dislocation. *Duration:* Three months. *Movements*, etc.: The arm is fixed in a

position forward and outward: abduction impossible; a maximum of motion forward and backward; elongation of the arm two centimetres. *Operation:* Incision in the direction of the axis of the humerus beginning at the spine of the scapula or the back of the shoulder, eight centimetres long, and curved parallel with the posterior border of the deltoid; the muscles attached to the tuberosities, together with the periosteum, were separated from the bone and the head freed and sawn through at the surgical neck. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate* ?. *Result remote:* At the discharge of the patient three months later motion of the arm was seemingly free forward and backward, while active abduction was limited and passive abduction possible to the horizontal, the arm being quite useful by means of systematic exercises. *Remarks* ?.

CASE CXIV. *1888. Adams.*[256] I. D. O. backward, resection, result good.

Man, ? years old. *Diagnosis:* Dislocation backward. *Duration:* Two years. *Movements*, etc.: Atrophy of the muscles of the shoulder; inability to use the arm. *Operation:* Incision (?), resection close below the surgical neck. *Difficulties and complications of the operation:* ? *Complications after the operation:* ? *Result immediate:* ? *Result remote:* One year after the patient was able to do light work as a railroad porter. *Remarks* ?.

CASE CXV. *1896. Brinton (J. H.).*[257] I. D. O. backward (subspinous), with fracture of head below tuberosities; V-incision over deltoid, resection, result satisfactory.

Man, aged 30 years. *Diagnosis:* By x-rays, head of humerus showed dislocation, with some bony attachment to upper part of infraspinous fossa and apparent transverse fracture of humerus just below tuberosities. *Duration:* Three months. *Movements*, etc.: No motion at head of bone. *Operation:* V-flap over deltoid; breaking down of adhesions with chisel; line of fracture irregularly transverse and just below the tuberosities; head of humerus with tuberosities removed down to the line of fracture; upper end of fragment smoothed; humerus brought into position, deltoid fibres drawn together by buried gut sutures and superficial fascia and skin by silkworm-gut sutures; drainage. *Difficulties and complications of the operation:* ? *Result immediate:* Primary union. *Result remote:* Satisfactory motion at false joint. *Remarks.* ?

HISTORIES OF CASES OF I. D. O. CONGENITAL, TREATED BY REDUCTION AND BY RESECTION.

CASE CXVI. *1882. Kuster.*[258] I. D. O. congenital, backward, reduction, death.

Sex ?, aged ? years. *Diagnosis:* Backward luxation, congenital of both shoulders. *Duration:* Fourteen months. *Movements*, etc.: Left arm is turned inward so that the olecranon pointed forward and upward, and gave the arm the appearance of having been completely turned once on its long axis. Fingers were permanently flexed, and could not be entirely straightened passively. The right arm and hand presented just the same appearance, but not to so great an extent. *Operation:* Head of the humerus freed, brought forward and rotated. Drainage and carbolic dressing. *Difficulties and complications of the operation* ?. *Complications after the operation:* Fever and suppuration. *Result immediate:* Wound did not heal. *Result remote:* Child died, about one month after operation, of vomiting and diarrhœa. *Remarks:* Author considered condition to be somewhat similar to congenital hip dislocation, and that dislocation was probably due to deficiency in development of glenoid cavity. At the post-mortem the right shoulder was opened; after cutting through the skin and fascia the capsule was seen drawn over head of humerus, which presented itself to the posterior lower edge of the atrophied deltoid. When capsule was opened the shoulder could not be reduced, because head was rotated so far inward that the greater tubercle, which was covered by the capsule, laid within the glenoid cavity. This cavity was small, very shallow and convex in its anterior half; in the posterior half irregularly enlarged and deepened. Left cavity showed similar conditions. Cartilage on head and in cavity partially destroyed.

CASE CXVII. *1892. Schede.*[259] I. D. O. congenital, backward, arthrotomy, reduction, necrotic fragments, result good.

Female, aged 8 years. *Diagnosis:* Congenital infraspinous luxation of right shoulder. *Duration:* Since birth, eight years. *Movements*, etc.: Much limited, and carried out with little power, abduction very slight, elevation in a horizontal position almost impossible. *Operation:* Incision downward in the axis of the arm one centimetre inside the outer edge of the acromion. *Difficulties and complications of the operation:* Capsule split, and incisions made into it both in front and behind. Glenoid cavity enlarged and deepened. Part of capsule in front removed, and the posterior portion freed from the glenoid cavity

and drawn forward so as to cover the head. Dislocation reduced, wound closed without drainage; the tendon of the biceps was cut through by accident; it did not run over the head but on the inner side and posteriorly. The glenoid cavity was divided into a surface with two facets by a ridge running vertically, the anterior of these two facets was very shallow and small, and corresponded to the normal glenoid cavity, the posterior was much larger, and belonged to the pathologically formed joint. Both facets lay within a common capsule, which, however, in its anterior part offered much too little space to receive the head. The head had lost its round form, with marked flattening of the anterior surface, which articulated with the new joint cavity, which faced backward and outward. The anterior facet was enlarged until it could receive the head. "The head, together with the capsule, was replaced." The coronoid process, which had developed quite abnormally in form and direction, and had become larger and more crooked than normal, and bridged over the inner portion of the normal joint surface in such way as to prevent reduction, was separated partially at its base by an osteotomy, and broken so far backward that it no longer prevented reduction. *Complications after the operation.* Four days later there was suppuration, and a drain had to be put in. All went well for some days, then again rise in temperature. The patient was anesthetized and wound sounded. The greater tubercle was found to be necrotic and removed. Joint washed out with corrosive salt mixture and dove in antiseptically. *Final outcome:* [illegible] Two months after primary operations [illegible] were supple and free, but passive except for elevation. [illegible] was almost normal [illegible] not above 45°. *Remarks.* The [illegible] was congenital and traumatic, as was proved by [illegible] who attended the mother's confinement.

[illegible] congenital,

[illegible] took place in [illegible] was noticed within at least a few hours [illegible] Subsequent suppuration, [illegible] a little below and [illegible] This was several months till when [illegible] the suit and movement [illegible] elbow could be closed [illegible] the head was behind posterior [illegible] the glenoid cavity.

Difficulties and complications of the operation: None. *Complications after the operation:* None. *Result immediate:* Healed mildly. *Result remote:* Still some spasmodic flexion of the hand. *Remarks:*

CASE CXIX. *1861. Post* (*Alfred C.*).[261] I. D. O. congenital, backward dislocation, fibrous anchylosis of the dislocated head, resection, result not stated.

Female, aged 8 years. *Diagnosis:* Dislocation of head of humerus, with fibrous anchylosis; head on dorsum scapula. *Duration:* Injured during birth of the child, and deformed ever since. *Movements*, etc.: Nutrition of limb defective; innervation much impaired, so that the patient can exert but little power in its movements. *Operation:* Longitudinal incision made near the posterior edge of the deltoid, dividing the fibres of that muscle, and exposing the head of the bone, which was found to be dislocated on the dorsum scapula; capsule divided, and extremity of the bone turned out. A leaden spatula was passed beneath the bone to protect the soft parts; exsection of upper extremity of bone; a portion of the bone, about three-fourths of an inch, was removed with saw; on examining the limb and moving it in different directions it was thought best to remove an additional piece of bone, this second portion as nearly as long as the first; hand then brought forward across anterior part of the chest, where it lay in an easy position, without apparent deformity. Edges of the wound brought together by means of eight twisted sutures made with insect pins. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Not stated. *Result remote:* Not stated.

CASE CXX. *1897. Phelps* (*A. M.*) *No. 1.*[262] I. D. O. congenital, backward (subspinous), resection, result very good.

Boy, aged 8 or 9 years. *Diagnosis:* Subspinous dislocation, the head is backward of the glenoid cavity. *Duration:* Congenital; according to the statement of the parents, the trouble with the arm had existed since birth; labor had been instrumental; it was discovered after birth, and the doctor suggested that it be left until the child got older; other physicians and surgeons had since seen the boy and were of the opinion that an operation was not advisable (*Medical Record*, September 21, 1895) *Movements*, etc.: A physician pronounced the case one of paralysis; all the movements of the arm interfered with, especially in placing the arm across the chest; the hand could not be carried to the mouth; movements of the humerus are accompanied

by movements of the scapula; the whole arm is rotated inward, the palm turned backward; the elbow protruded a little from the side of the chest; the head of the humerus presented a bony prominence below the spine of the scapula. Flexion and extension of the forearm were weak, pronation and supination were normal. *Operation:* Curved incision along the lower edge of the deltoid and on to the scapula, and flap turned down; it would be best to curve the incision downward and turn the flap upward, as it would give better drainage. *Difficulties and complications of the operation:* The posterior edge of the glenoid cavity was gone and the cavity was about two-thirds the normal size; a portion of the head of the humerus was cut away in order to fit it to the socket; also cut away a portion of the redundant capsule posteriorly; the bone replaced and a stitch put in behind to help retain the head in place. *Complications after the operation:* None. *Result immediate:* Drainage-tube left a week. *Result remote:* Is satisfactory. Dr. A. P. Dudley saw the patient a year after the operation, and there was little difference between the two arms. *Remarks:* Dr. Dudley did not doubt that the injury had occurred during delivery. Doctors who had seen the patient before were of the opinion that it was one of paralysis. Dr. A. M. Phelps says that the method promised success during the first year, although one case has been operated in which it was successful at the fifth year.

CASE CXXI. *1897. Phelps (A. M.),*[263] *No. 2.* Congenital, backward (subspinous), result fair.

Boy, aged ? years. *Diagnosis:* Subspinous dislocation. *Duration:* Congenital. *Movements*, etc.: A neurologist had found the reaction of degeneration, which seemed to be due to some pressure neurosis. *Operation: ? Difficulties and complications of the operation: ? Complications after the operation: ?. Result immediate:* Suppuration due to catgut, which necessitated a counter-opening. *Result remote:* As a result of the scars motion was not so complete as it might have otherwise become; the reaction of degeneration disappeared. *Remarks: ?.*

HISTORIES OF I. D. O. RECURRENT OR HABITUAL.

CASE CXXII. *1892. Ricard, No. 1.*[264] I. D. O. recurrent, forward, anterior incision, stitching of capsule (reefing), result good.

Man, aged ? years. *Diagnosis: ?* Dislocates his shoulder on very slight occasions. *Duration: Movements*, etc.: ? *Operation:* An in-

cision about twelve centimetres long on the pectoro-deltoid interstice; at the upper end the incision is prolonged at a right angle by following the contour of the insertion of the deltoid on the clavicle and acromion. The deltoid is detached in its entire extent from the incision and turned outward and backward. The coraco-brachialis is then lifted by an assistant so as to disclose the subscapular muscle at its humeral insertion. The operator frees the upper and inferior edges of this muscle so as to freely expose the capsule. The arm is then rotated forcibly; in this way the anterior wall of the capsule is relieved of tension. Then, at the top of this wall, through the capsule and into the thickness of the subscapular muscle, Ricard passes three stitches of coarse flat silk, vertically directed, and about two centimetres one from the other. The free extremities of these threads are tied (*deux à deux*) in order to reduce this anterior wall to the least, but most, resistant and rigid thickness. In front of its interline, after the constriction of the threads, is found a resistant surface which the fingers cannot depress. It is essential that during this time the arm should be forcibly carried inward. After hæmostasis the insertions of the deltoid are restored with catgut; then follows suture of skin without drainage? *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate: ? Result remote:* In the nine months following the operation, when he was employed wheeling a wheelbarrow, he had not dislocated his shoulder. *Remarks: ?* These cases were reported by Ricard at the Académie de Médécine, at the meeting on October 31, 1892; but in the *Transactions* of the society (*Bulletin de l'Académie de Médécine*, 1892, 3d Series, vol. xxviii.), under this date, there is only a note of three lines, to the effect that he reported these cases. As reported in the *Gazette des Hôpitaux*, they come under the society meetings, and so are given only in abstract form. No other reference to these cases has been found.

CASE CXXIII. *1892. Ricard,*[265] *No. 2.* I. D. O. recurrent, forward, anterior incision, stitching of capsule (reefing), result good.

Man, aged ? years. *Diagnosis:* Dislocated his shoulder on slight effort or during epileptic attacks; reduction was often difficult, and required anæsthetic. *Duration: ? Movements*, etc.: ? *Operation:* Same as foregoing. *Difficulties and complications of the operation: ? Complications after the operation: ? Result immediate: ? Result remote:* Luxation had not occurred in three months after the operation, although the patient had had epileptic attacks. *Remarks: ?.*

CASE CXXIV. *1898. Samosch (J.).*[266] I. D. O. recurrent, forward incision, lapping, stitching, result good.

Male, aged 38 years. *Diagnosis:* Dislocation of right shoulder. *Duration:* Indefinite; first injury ten years before operation. *Operation:* Joint laid open according to the incision of Ollier-Huter. It was necessary to ligate the vena cephalica. The only pathological condition was a relaxation or stretching of capsule of joint in such a manner that both anteriorly and internally there was a considerable distention, like a hernial sac, into which the head of the humerus could sink. In order to diminish the size of the capsule the distended portion of the capsule was split in a perpendicular direction throughout its entire length. The medial portion of this distention was drawn over the lateral, then pulled strongly forward and laterally, and in this position was sewn with four buried silver stitches to the outer wall of the median portion of the capsule. After careful stopping of hemorrhage, the cavity of the wound was tamponed. *Result immediate:* Wound healed without suppuration. *Result remote:* Weeks after the operation, when patient was discharged, he could swing a weight of two kilogrammes around in a circle, and he could raise a weight of four kilogrammes horizontally without use of scapula. *Remarks:* Operation was undertaken because of frequency of dislocation. It had occurred twenty times or more. It had been at first replaced by doctors, but finally patient learned to do it for himself. When first seen at the clinic the arm was not dislocated, but it was very easy to do this.

CASE CXXV. *1884. Gerster.*[267] I. D. O. recurrent, forward (subcoracoid), resection of part of capsule, stitching, result fair.

Female, aged 20 years. *Diagnosis:* Subcoracoid dislocation of the humerus. *Duration:* Seven weeks. *Movements,* etc.: Paralysis of serratus magnus. *Operation:* Reduction did not offer the least difficulty, but the weight of the extremity alone was sufficient to cause the reappearance of the dislocation. The reduced humerus was kept in normal position five weeks by means of an ample plaster-of-Paris dressing enveloping the arm, shoulder, and thorax. When removed reappearance of dislocation; hence, arthrotomy by the anterior incision was performed. It was found that the inner aspect of the joint capsule, the side facing the axilla, was abnormally relaxed, and, therefore, a piece one inch long and two inches wide was excised from it while the arm was forcibly rotated outward. A counter incision was made

into the posterior part of the capsule for drainage, and capillary drainage by a fascicle of catgut strands was established. The anterior wound was closed by sutures. *Complications after the operation:* Six hours after the operation very alarming septic fever set in, temperature 103° F., great sickness and dejection. Wound opened; among the seven catgut ligatures there was found one much thickened, turbid, and infiltrated with and surrounded by pus. The remainder of the wound was found to be normal, the rest of the ligatures being slightly thickened, not transparent. The fascicle was removed and replaced by a rubber drainage-tube. Wound treated openly, temperature fell to normal, and the case progressed favorably. *Result immediate:* Tube removed at second week, wound healed in eight weeks. Healing was retarded by an attack of erysipelas commencing from the opening made for the drainage-tube at a time when healing was nearly complete. *Result remote:* The function of the joint was now fair, and promised to improve and become normal, since its mobility was considerable now, although very little orthopedic treatment has been employed. *Remarks* ?.

CASE CXXVI. *1897. Burrell (H. L.), No. 1.*[268] I. D. O. recurrent, forward (subcoracoid), anterior incision, resection of part of capsule, result good.

Man, aged 27 years. *Diagnosis:* Forward dislocation. *Duration:* ?. *Movements*, etc.: ?. *Operation:* An incision was made over the deltoid muscle, beginning at its insertion and extending up about six inches. The fibres of the deltoid were separated and three-fourths of the tendon of the insertion of the pectoralis major was slit down to permit access to the joint. The capsule of the joint was found intact, but very loose. From the inner and anterior aspect of the capsule a piece was removed four centimetres long and one centimetre broad. This opened the joint. It was explored, and as far as could be felt was normal. The capsule was closed by catgut sutures, and the wound was closed by silkworm-gut sutures. A sterile dressing was applied, the arm being put up with the forearm flexed and the point of the elbow raised and carried inward toward the median line. *Difficulties and complications of the operation:* ?. *Result immediate:* There was considerable pain after the operation, but it was controlled by morphia; aseptic healing occurred. The arm was dressed and all sutures removed in eighteen days, but the arm was restrained by a Velpeau bandage. Massage was carried out in this

case for four weeks. *Result remote:* The patient returned to his full work at the end of eight weeks from the time of the operation (Burrell, page 16).

CASE CXXVII. *1896. Burrell (H. L.), No. 2.*[280] I. D. O. recurrent, forward, subcoracoid (?), anterior incision, resection of capsule in part, result good.

Man, well developed, of ordinary height; aged 36 years. *Diagnosis:* Forward (subcoracoid dislocation ?). *Duration:* ?. *Movements*, etc.: ?. *Operation:* Same as above. *Difficulties and complications of the operation:* ?. *Complications after the operation:* ?. *Result immediate:* ?. *Result remote:* ?. *Remarks* ?.

CASE CXXVIII. *1888. Albert (E.).*[279] I. D. O. recurrent, forward (?), posterior incision, arthrotomy, reduction and stitching of head, result anchylosis.

Female, aged 19 years. *Diagnosis:* No mention of the sort of dislocation. *Duration:* About sixteen months. *Movements*, etc.: Slight crepitation in rotation; power of arm much diminished. *Operation:* A cut six centimetres long was made on the posterior side of the joint, along course of fibres of the infraspinatus muscle. The other muscles which had to be cut through were also severed in the course of their fibres, and edges held apart with hooks, the glenoid cavity was freed of its cartilaginous covering with a curved chisel, and then the head of the humerus was made to fit the cavity, by freeing it of its cartilage and shaving the head quite smooth. Then a stitch of kangaroo-gut was passed through the head and the edge of the cavity. A strip of iodoform gauze was passed through the muscles into the joint, the wound was put up with a sublimate dressing, and the arm firmly fixed with a stiff bandage, in a position of flexion. *Difficulties and complications of the operation:* The posterior wall of the capsule about the joint showed itself much thicker than normal, and much of it had to be cut away with the scissors. *Complications after the operation:* None. *Result immediate:* Healing by first intention. *Result remote:* Ankylosis in the joint. *Remarks:* The shoulder had slipped out of joint and been replaced nine times between February, 1896, and June, 1897; it would slip out on very slight causes, as, for instance, when putting on a dress in raising her arm.

CASE CXXIX. *1882. Cramer.*[281] I. D. O. recurrent (subcoracoid), anterior incision, resection, result fair.

Female, aged 30 years. *Diagnosis;* Subcoracoid dislocation. *Dura-*

tion: About five years since first dislocation; patient was an epileptic, and had dislocated shoulder nineteen times in last five years. It could be easily reduced, but could not be kept in place. Operation was decided upon because of the distress she experienced from these frequent dislocations and inability to work. *Movements*, etc.: Pain and swelling of arm, atrophy of shoulder. *Operation:* Six centimetres of head of humerus resected according to Langenbeck's method (?), capsule found stretched, and no apparent tear in it. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Wound healed by first intention. *Result remote:* Five months after operation passive movements can all be carried out without difficulty, and action still much limited. Elevation to a horizontal line not possible, and only then by means of shoulder-blade. Patient can touch her mouth, but eating is difficult, and also top of head and back of neck, and can dress her hair, but she still has pains in arm at times. She can do all housework, like washing, cooking, etc. Shoulder is still atrophied. Result only fair. *Remarks* ?.

CASE CXXX *1882. Popke.*[272] I. D. O. recurrent, anterior incision, resection, result improved.

Male, aged 30 years. *Diagnosis:* Luxation of left shoulder (habitual), *Duration:* Six years. *Movements*, etc.: ? *Operation:* Resection with anterior incision; capsule showed no tear, so was split in ordinary manner. *Difficulties and complications of the operation: ? Complications after the operation:* Stitch abscess and slight necrosis at end of humerus. *Result immediate:* Healed slowly. *Result remote:* Patient discharged at the end of six weeks with arm in good position. Patient later informed surgeon by letter that as far as use of arm was concerned he was much better satisfied than before the operation. *Remarks:* Patient was an epileptic, and arm could not be kept in position by any bandage. It easily slipped out of place, and was easily reduced, though this could not be done at time of operation, when patient was under chloroform; at operation the following conditions were observed; behind, on the head of the humerns, the cartilage was absent over an area one-third of head; the half-moon shaped surface, which is smooth and free of cartilage, is undoubtedly due to the breaking off of a wedge-shaped piece of bone from the head; but this piece was not to be found in the wound, and had probably been absorbed. The joint surface of the scapula was also deformed, so that it was no longer as normal, broader below than above, but had a more oval shape, so that it was broader

above than below. The capsule had been torn off from the whole lower and inner portion of the deformed glenoid cavity, so that there was an opening present which led into the subscapular bursa. The edge of the capsule about this opening was irregularly thickened, and to it was attached a hard bony body, about the size of a pea, covered with cartilage, evidently the remnant of a fragment, which at the time of the injury had been broken off with the capsule from the joint surface of the scapula.

CASE CXXXI. *1883. Sacré.*[273] I. D. O. recurrent (subcoracoid), anterior incision, resection, result good.

Female, aged 26 years. *Diagnosis:* Incomplete subcoracoid luxation of left shoulder. *Duration:* Six months. *Movements*, etc.: Voluntary ones are very limited and so painful that limb is held absolutely motionless. Abduction impossible. Pain is constant. Passive movements cause patient to cry. *Operation:* A vertical incision slightly posterior to coracoid process and extending to the point of the deltoid. Skin, deltoid, and articular capsule divided. Resection of head of humerus at surgical neck. Drain at lower angle of wound, which is elsewhere sewed up with catgut. Antiseptic dressing. Desault bandage. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Wound healed completely two weeks after operation. *Result remote:* When seen three months later all movements of the joint could be carried out without pain, except abduction, which was impossible because of the paralysis and atrophy of the deltoid. Could put hand on forehead and backward on the lumbar region. *Remarks:* The arm could be easily reduced at time of operation, but would not stay in place, slipping out immediately. At time of operation the joint was found quite normal, there was no change in the articular surface, and the fibrous capsule was not torn.

CASE CXXXII. *1893. Owens (No. 2.)*[274] I. D. O. recurrent, forward, anterior incision, resection, result fair.

Male, aged 25 years. *Diagnosis:* Subcoracoid, frequently recurring dislocation. *Duration:* Five years ago first dislocation from epileptic fits, since then it has happpened nearly twenty times, and reduced under chloroform. *Movements*, etc.: Not stated *Operation:* Being under anæsthetic, a little manipulation easily produced a subcoracoid dislocation, which could be as easily reduced. The head of the bone with the tuberosities was resected, and when this was done the rent in

the capsule by which the bone was accustomed to make its exit was seen and recognized. *Difficulties and complications of the operation:* ? *Complications after the operation:* ? *Result immediate:* Wound healed at once, beginning of third week gentle movements were begun. *Result remote:* He now has fair use of the arm, and all promises well for its future usefulness, with no recurrence of his old trouble. *Remarks* ?.

CASE CXXXIII. *1896. Monks (G. H.)*[275] I. D. O. recurrent, forward (subcoracoid), anterior incision, resection, improved.

Man, aged 57 years. *Diagnosis:* Subcoracoid dislocation. *Duration:* Ten months. *Movements*, etc.: Atrophy of all the muscles about the shoulder, arm, forearm, and hand; patient's grasp very weak; voluntary movements extremely limited; complete ulnar paralysis, also partially of the median, musculo-spiralis, circumflex; says he has been daily losing power in his arm up to the time he entered the hospital, when he stated it was about useless. *Operation:* Incision in the anterior margin of the deltoid; section of the supraspinous, infraspinous, small round, subscapular; long tendon of the biceps dislocated from its groove, but not divided. *Difficulties and complications of the operation:* None. *Complications after the operation:* None. *Result immediate:* Primary union. *Result remote:* Can use arm to a far greater degree and with a much greater range of motions than was possible before the operation, condition of the nerves also improved considerably. Left the hospital, and no further account of him. *Remarks:* The head of the bone was very much atrophied, and on being removed it could be easily crushed in the bone forceps, showing that had an attempt been made to reduce the dislocation by manipulations a fracture would probably have taken place at the neck of the bone, thus adding a new complication.

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